United States Department of the Interior
Bureau of Land Management

Battle Mountain Field Office
Battle Mountain, Nevada

August 1999

South Pipeline Project
Draft Environmental Impact Statement

NV64-93-001P(96-2A)
NV063-EIS98-014

COOPERATING AGENCIES:

Nevada Department of Conservation and Natural Resources, Division of Wildlife
U.S. Army Corps of Engineers

MISSION STATEMENT

The Bureau of Land Management is responsible for the stewardship of our public lands. It is committed to manage, protect, and improve these lands in a manner to serve the needs of the American people for all times. Management is based upon the principles of multiple use and sustained yield of our nation's resources within a framework of environmental responsibility and scientific technology. These resources include recreation, rangelands, timber, minerals, watershed, fish and wildlife, wilderness, air and scenic, scientific, and cultural values.

EIS NUMBER: NV063-EIS98-014
PLAN OF OPERATIONS NUMBER: NV64-93-001P(96-2A)

United States Department of the Interior

Bureau of Land Management
Battle Mountain Field Office
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Battle Mountain, Nevada 89820
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AUG 10 1999

In Reply Refer to:
NV63-EIS98-14
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N63-93-001P
3809
(NV060.3)

Dear Reader:

Enclosed for your review and comment is the Draft Environmental Impact Statement for the South Pipeline Project (Project), prepared by the Bureau of Land Management, Battle Mountain Field Office (BLM). The Project is being proposed by the Cortez Gold Mines, Inc. (CGM).

The Draft Environmental Impact Statement is based on the Amendment to the Pipeline Plan of Operations for the South Pipeline Project submitted to the Bureau of Land Management under 43 Code of Federal Regulations Subpart 3809. The Draft Environmental Impact Statement analyzes the direct, indirect, and cumulative impacts associated with the mining and processing of reserves in the Project Area, located approximately 30 miles south-east of Battle Mountain, Nevada. The Project is located adjacent to CGM's Pipeline project.

The BLM requests your review of and comment on the adequacy and accuracy of this document. Written comments on the Draft Environmental Impact Statement must be postmarked by October 5, 1999, and should be sent to: **Bureau of Land Management, Battle Mountain Field Office, South Pipeline EIS Project Manager, 50 Bastian Road, Battle Mountain, Nevada 89820-1420.**

In addition, public meetings to accept verbal and written comments on the Draft Environmental Impact Statement are scheduled for the following dates, times, and locations:

August 30, 1999, 7:00 p.m., at the Bureau of Land Management, Battle Mountain Field Office, Battle Mountain, Nevada

August 31, 1999, 7:00 p.m., at the Crescent Valley Town Hall, Crescent Valley, Nevada

A Final Environmental Impact Statement will be prepared that will consider the comments received during the public review and comment period. The Final Environmental Impact Statement may be in an abbreviated format; therefore, you should retain this Draft Environmental Impact Statement as a reference. If you would like any additional information, please contact Gary Foulkes, South Pipeline EIS Project Manager at (775) 635-4060.

Sincerely,

M. Lee Douthit

for Gerald M. Smith
Field Manager

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DRAFT
ENVIRONMENTAL IMPACT STATEMENT
SOUTH PIPELINE PROJECT

Lead Agency:	U.S. Department of Interior Bureau of Land Management Battle Mountain Field Office
Project Location:	Lander County, Nevada
EIS Number:	NV063-EIS98-014
Plan of Operations Number:	NV64-93-001P(96-2A)
Correspondence on this EIS Should be Directed to:	Gary Foulkes Project Manager Bureau of Land Management Battle Mountain Field Office 50 Bastian Road Battle Mountain, Nevada 89820-1420 (775) 635-4060
Date Draft EIS Filed with the U.S. Environmental Protection Agency:	July 30, 1999
Date by Which Comments Must be Postmarked to the BLM:	October 5, 1999

ABSTRACT

Cortez Gold Mines, Inc. (CGM) proposes to extend gold mining operations at the Pipeline Mine within the Gold Acres Mining District in Lander County, approximately 30 miles southeast of Battle Mountain, Nevada. The South Pipeline Project (Proposed Action) would include an expansion of the existing open pit and waste rock disposal sites, and the development of heap leach and ancillary facilities. The Proposed Action would require surface disturbance of 4,450 acres, all of which is public land administered by the Bureau of Land Management. Mining operations are expected to occur seven-days-a-week, 24-hours-a-day, for an additional 10 years (total life of 18 years).

This Draft Environmental Impact Statement analyzes the environmental effects of the South Pipeline Project, the No Action Alternative, and the Pipeline Backfill Alternative.

Responsible Official for the EIS: Gerald M. Smith
Field Office Manager
Battle Mountain Field Office

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SOUTH PIPELINE PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT

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EXECUTIVE SUMMARY

Purpose of this Document

This Draft Environmental Impact Statement (DEIS) has been prepared by the U.S.D.I. Bureau of Land Management (BLM), the Lead Agency with respect to compliance with the National Environmental Policy Act (NEPA) and its implementing regulations, and with Co-operating Agencies, U.S. Army Corps of Engineers (USACE) and Nevada Division of Wildlife (NDOW). The purpose of the document is to analyze the environmental effects of the Proposed Action, which consists of the proposal by Cortez Gold Mines (CGM) to develop the South Pipeline ore deposit.

The purpose of the EIS is to inform decision-makers in all federal agencies required to approve authorizing actions, as well as the public, of the anticipated significant environmental effects of the Proposed Action, the possible ways to mitigate the significant effects of the Proposed Action, and reasonable alternatives which could feasibly reduce the significant environmental impacts of the Proposed Action to below the level of significance. The information in an EIS does not control an agency's discretion on a project.

The Draft EIS has been prepared in a single volume. All technical documents used to support this EIS are available for review during normal business hours at the BLM's Battle Mountain Field Office in Battle Mountain, Nevada.

Proposed Action

The Proposed Action (CGM's South Pipeline Project [Project]) is to develop the South Pipeline ore deposit and construct associated facilities to continue to extract gold from the mined ore within the Project Area (*Amendment to the Pipeline Plan of Operations for the South Pipeline Project*, CGM 1996). CGM plans to conduct certain activities at the approved Cortez Facilities without substantial modification to those facilities. In addition, the Proposed Action includes an right-of-way (ROW) application for a water pipeline (CGM 1999). The Proposed Action is an expansion of the existing CGM Pipeline project and a modification of a portion of the Gold Acres Facilities.

The Proposed Action would extend the operational life of CGM's mining and processing activities, as well as the employment of 450-500 individuals, by approximately eight years. The life of the Proposed Action would total approximately 10 years, which includes approximately eight years for mining and the remaining years for further ore processing and site closure. Some of this time frame would run coincident with the time frame outlined in the Pipeline FEIS. The actual schedule could be different if reserves are increased or if economic conditions change.

Principal components of the Proposed Action include the following: (a) an expansion of the Pipeline open pit, which would eventually include the South Pipeline open pit; (b) a new heap leach facility; (c) an expansion of the existing Pipeline waste rock dump; (d) an expansion of the existing Pipeline tailings facility; (e) an extension of process solution pipelines from the South Pipeline leach facility to other process facilities within the Project Area; (f) new ore and sub-grade ore and growth media stockpiles; (g) the Pipeline mill throughput would be increased; (h) new ground water extraction wells would be constructed; (i) the rate of ground water pumping and disposal would be approximately 34,500 gpm or lower; (j) the amount of surface disturbance within the Project Area would be increased; (k) an existing portion of the Cortez Mine Road would be rerouted to the east; (l) a portion of the ROW for the Gold Acres haul road in the Project Mine and Process Area would be abandoned; (m) ROW for a pipeline to deliver water to the Dean Ranch; and (n) up to 6,000 gpm (annualized) would be delivered to the adjacent Dean Ranch via the ROW and consumptively used on private land. The Proposed Action would also utilize, without modification, many of the same existing CGM facilities or equipment used for other CGM operations, including the Cortez continuous fluid bed (CFB) roaster, Carbon-In-Leach (CIL) mill, and tailings facility, and the Pipeline ancillary facilities (administrative offices and support facilities, fresh water production supply wells, power supply and utilities, waste disposal and sanitary systems, chemical storage and hazardous material management facilities, production dewatering wells, turbine pumps, main discharge lines, conveyance lines and infiltration basins, roads, fencing, and security and fire protection systems). The use and occupancy of these facilities would be in compliance with 43 Code of Federal Regulations (CFR) 3715, which regulates the storage of equipment and supplies, occupancy of structures, and structures on public land which restrict public access.

The Proposed Action would not alter the average mining rate currently used by CGM within the Pipeline mine and process area. The average daily mining rate would continue at approximately 150,000 tons per day

(tpd), and the maximum daily mining rate would be approximately 250,000 tpd. Advanced pre-strip requirements would result in higher daily average mining rates until the top of the ore body was exposed. Following approval of the Proposed Action, mining would occur in the Pipeline and/or South Pipeline open pits at any time, and either ore, waste, or any combination of the two would be handled.

An estimated 150 million tons of ore would be mined from the South Pipeline open pit as part of the Proposed Action. A portion of the ore would be leached on new heap leach pads. The remainder would be processed at the approved Pipeline mill and tailings facility and at the existing Cortez CFB roaster, CIL mill, and tailings facility. The Pipeline tailings facility would be expanded to accommodate the ore projected to be mined from the South Pipeline deposit. The waste-to-ore ratio is approximately 3:1, resulting in approximately 450 million tons of waste rock that would also be mined from the South Pipeline open pit. The waste rock would be placed in the Project waste rock dump, which would be an expansion of the approved Pipeline waste rock dump. The Proposed Action would create a maximum of approximately 4,450 acres of new surface disturbance within the Project Area, creating a total of approximately 7,616 acres of surface disturbance associated with CGM's operations within the Project Area.

During the operation of the South Pipeline open pit, CGM, with concurrence from the BLM, may determine based on engineering and economic considerations that disposal of a portion of the South Pipeline waste rock in the Pipeline open pit is feasible and environmentally sound. If this option were to occur, the majority of the waste rock would be hauled to a mined-out portion of the Pipeline open pit. Dumping over the pit rim may also be considered to fill the catch benches on the upper portion of the pit wall, including the area adjacent to the ultimate pit lake level. It is estimated that up to 250 million tons of waste rock would possibly be disposed of at this location.

Under the Proposed Action CGM would conduct dewatering operations of sufficient capacity to allow for the planned mining of the South Pipeline open pit. The anticipated dewatering requirements are based on an evaluation of the hydrogeology of the area. Table ES-1 presents the anticipated annual average dewatering rates, in gpm, to conduct the planned mining activities. Based on hydrologic modeling (Geomega 1998a), dewatering rates for the first six years of the expected 14 years of dewatering are the same as under the Existing Facilities Chapter (Section 2.3.1). The Proposed Action would extend the time period over which dewatering operations would occur.

Table ES-1: Modeled Dewatering Rates for the Mining of the South Pipeline Ore Deposit

Time Year	Dewatering (gpm)
0	4,100
1	15,850
2	25,150
3	16,800
4	15,850
5	21,700
6	17,700
7	20,950
8	13,100
9	16,150
10	17,900
11	5,100
12	10,450
13	13,700

As seen from the current dewatering operations and as shown in the recent hydrologic modeling, dewatering of the South Pipeline open pit would be largely accomplished during the dewatering of the approved Pipeline open pit. Additional dewatering wells peripheral to and within the South Pipeline open pit would be necessary to accomplish adequate dewatering due to local hydrologic conditions. The dewatering wells, piping, and associated components would be installed in essentially the same manner as those associated with the Pipeline project.

Mine dewatering is expected to provide water of adequate quality and sufficient quantity to supply mining, milling, and non-potable service needs for both the Project and the other ongoing CGM operations. Surplus water would continue to be discharged through the approved infiltration facilities in the Project Area and delivered to CGM-owned parcels and consumptively used.

Under the Proposed Action, CGM proposes to manage water encountered in the additional eight years of dewatering through the use of the authorized Pipeline infiltration water disposal operations and delivered to CGM-owned parcels and consumptively used. In addition, CGM proposes a water management option, subject to formal feasibility analysis, of injecting a percentage of the water from the dewatering operations (approximately 5,000 to 10,000 gpm). The Injection Option would involve the construction of a system to re-inject pumped water into valley alluvial deposits via a well field. Water would be piped to the injection well field or fields from the pit dewatering pumps. The injection well fields would handle a portion of the dewatering water and would be utilized, if feasible, in conjunction with infiltration basins. The implementation of injection wells would be dependent upon additional, detailed feasibility and engineering studies, as well as pre-construction test injection wells, to ascertain potential operating efficiencies. Total disturbance for injection wells is estimated at 50 acres. This acreage would be included in the Pipeline and South Pipeline surface disturbance. Monitoring of the dewatering and water disposal system under the Proposed Action would continue as currently conducted under the Pipeline project but would be expanded to cover additional activities under the Proposed Action.

Reclamation activities would be conducted in accordance with BLM surface management regulations 43 CFR 3809 1-3(d) and State of Nevada regulations NAC 519A. Areas of disturbance associated with the Project to be reclaimed consist of the South Pipeline waste rock dump, the new heap leach facility, the stockpile areas, haul and access roads, and other ancillary facilities associated with the Proposed Action. Reclamation of those facilities approved under the Pipeline Project Reclamation Permit, the Crescent Pit Reclamation Permit, and the Gold Acres Reclamation Permit are covered under separate environmental documents and their associated plans of operations. The Project is an amendment to the Pipeline Plan of Operation (CGM 1996).

The construction, maintenance, and reclamation phases of the Project have been designed to prevent unnecessary and undue degradation of the lands affected by CGM throughout the life of the Project. The objectives of the reclamation plan include minimizing or eliminating public safety hazards, stabilizing disturbed areas, and providing a post-mining surface conditions that would be consistent with long-term land uses. The primary long-term land uses are expected to be wildlife habitat, livestock grazing, and possible mining-related activity.

With the exception of the South Pipeline open pit, which would be constructed in its final configuration, reclamation activities would consist of regrading, topsoiling, and revegetating disturbed areas. The heap leach pad will be neutralized before regrading, topsoiling, and revegetation. Other reclamation would include removal of the pipes for transporting infiltration waters and pregnant/barren solutions and installing safety features around the South Pipeline open pit.

Pipeline Backfill Alternative

The Pipeline Backfill Alternative would dispose of waste rock from the South Pipeline open pit into the Pipeline open pit rather than the South Pipeline waste rock dump. Implementation of the Pipeline Backfill Alternative would be essentially identical to the Proposed Action with the following exceptions:

- The mining sequence would be revised so that the Pipeline open pit is completed first, followed by mining of the northern segments of the South Pipeline open pit, then the remainder of the South Pipeline open pit;
- Backfilling would occur by end-dumping material either from the Pipeline open pit rim or from within the open pit, depending on haul road locations in the open pit and the location of mining within the South Pipeline open pit; and
- A portion of the waste rock from the South Pipeline open pit would be hauled via haul trucks to the Pipeline open pit for backfilling, and a portion of the 1,096-acre South Pipeline waste rock dump would not be constructed. Of the 450 million tons of waste rock mined from the South Pipeline open pit, approximately 250 million tons would be required to backfill the Pipeline open pit. Following backfilling, the Pipeline open pit would be reclaimed.

Implementation of the Pipeline Backfill Alternative would result in surface area disturbance of approximately 3,841 acres, as opposed to 4,450 acres from the Proposed Action.

No Action Alternative

Under the No Action Alternative, CGM would not develop the South Pipeline ore body as presently defined. CGM would continue operations at the Pipeline project, as previously approved.

Alternatives Eliminated from Detailed Consideration

As outlined in the Project Scoping Document, several alternatives were identified for consideration in this EIS. The Project Scoping Document is on file and available for review at the Battle Mountain Field Office. The Alternatives eliminated from detailed consideration are divided into the following groups:

- Alternatives for Discharge of pumped water;
- Alternatives for Pit Backfilling; and,
- Project Component Alternatives.

Alternatives for the discharge of pumped water includes; discharge to the Humboldt River, infiltration upgradient of the open pit, and injection into the Paleozoic Age bedrock. The injection of water from dewatering operations potentially could occur in either the Quaternary Age basin-fill alluvium or the Paleozoic Age bedrock. As part of the Proposed Action, CGM has planned an option to inject water from the dewatering operations into the Quaternary Age basin-fill alluvium. Therefore, an alternative addressing the injection of water in the Quaternary Age basin-fill alluvium has not been further considered.

Alternatives for pit backfilling include; the backfilling of the Horse Canyon open pit, the backfilling of the Cortez open pit, the backfilling of the Gold Acres open pit, and the backfilling of the South Pipeline open pit. As part of the Proposed Action, CGM has planned an option to partially backfill the Pipeline open pit. Therefore, an alternative to backfill the Pipeline open pit has not been further considered.

Project component alternatives include; the use of underground mining methods, a decrease in the rate of mining, a smaller sized Project, other locations for Project components outside the Project Area, and other locations for Project components inside the Project Area.

Important Issues and Impact Conclusions

The environmental consequences of, mitigation measures for, and level of significance of the environmental consequences before and after mitigation for the Proposed Action and the alternatives are summarized in Table ES-2. Under the discussion of impacts for the Proposed Action in Table ES-2, unless otherwise specifically stated, the impacts are the same for all options included in the Proposed Action. Detailed discussions of the same topics are discussed in Chapter 4 of the EIS.

BLM Preferred Alternative

Chapter V, Section B.2.b. of the BLM NEPA Handbook directs that "The manager responsible for preparing the EIS should select the BLM's preferred alternative. ... For externally initiated proposals, ... the BLM selects its preferred alternative unless another law prohibits such an expression. ... The selection of the preferred alternative should be based on the environmental analysis as well as consideration of other factors which influence the decision or are required under another statutory authority."

Thus, the BLM Preferred Alternative is the alternative that best fulfills the agency's statutory mission and responsibilities, giving consideration to economic, environmental, technical and other factors. BLM has determined that the preferred alternative is the Proposed Action as outlined in Chapter 3 with the inclusion of the identified mitigation measures to the Proposed Action as specified in Chapter 4.

Table ES-2: Summary of Potential Environmental Effects, Mitigation Measures, and Residual Impacts

	PROPOSED ACTION	PIPELINE BACKFILL ALTERNATIVE	NO ACTION ALTERNATIVE
	GEOLOGY AND MINERAL RESOURCES		
Issue:	Slope Stability and Seismic Issues		
Impact:	**Impact 4.2.3.3.1-1:** Minor slope failures would occur from seismic events in the Project Area.	Same as Proposed Action.	No impact.
Level of Significance:	Less than significant.	Less than significant.	Not applicable.
Mitigation Measures:	None.	None.	None.
Residual Impact:	None.	None.	None.
Issue:	Subsidence Due to Dewatering Activities		
Impact:	**Impact 4.2.3.3.1-2:** Structural damage to mine facilities would occur from land subsidence due to dewatering activities.	Same as Proposed Action.	No impact.
Level of Significance:	Less than significant.	Less than significant.	Not applicable.
Mitigation Measures:	None.	None.	None.
Residual Impact:	None.	None.	None.
Issue:	Restriction of Future Mineral Resource Extraction		
Impact:	**Impact 4.2.3.3.1-3:** Implementation of the Proposed Action would result in the production of approximately 4.58 million ounces of gold, minor amounts of silver, and byproduct production of negligible amounts of other metals.	Same as Proposed Action.	No impact.
Level of Significance:	Potentially significant.	Potentially significant.	Not applicable.
Mitigation Measures:	No mitigation measures appear feasible.	No mitigation measures appear feasible.	None.
Residual Impact:	Potential.	Potential.	None.
Impact:	**Impact 4.2.3.3.1-4:** The restriction of future mineral resource extraction due to facility location or placement of waste rock in the Pipeline open pit.	**Impact 4.2.3.4.1-1:** The restriction of future mineral resource extraction due to placement of waste rock in the Pipeline open pit.	**Impact 4.2.3.5.1-1:** The restriction of future mineral resource extraction due to implementation of the No Action Alternative.
Level of Significance:	Potentially significant.	Potentially significant.	Significant.
Mitigation Measures:	No mitigation measures appear feasible.	No mitigation measures appear feasible.	None.
Residual Impact:	Potential.	Potential.	Identified mineral resource would not be developed.
	SOIL RESOURCES		
Issue:	Accelerated Soil Erosion Rates		
Impact:	**Impact 4.3.3.3.2-1:** Accelerated soil erosion rates may occur during the mine expansion due to the continued removal of vegetation, surface soil disturbance, soil compaction, soil salvaging and reclamation.	Same as Proposed Action.	No impact.
Level of Significance:	Less than significant.	Less than significant.	Not applicable.
Mitigation Measures:	None.	None.	None.
Residual Impact:	None.	None.	None.
Impact:	**Impact 4.3.3.3.2-2:** Surface disturbance and soil compaction would reduce the water infiltration rate of soils potentially increasing runoff.	Same as Proposed Action, however implementation of this alternative would disturb 486 fewer acres than the Proposed Action.	No impact.

	PROPOSED ACTION	PIPELINE BACKFILL ALTERNATIVE	NO ACTION ALTERNATIVE
Level of Significance:	Less than significant.	Less than significant.	Not applicable.
Mitigation Measures:	None.	None.	None.
Residual Impact:	Unavoidable loss of minor amounts of soils.	Unavoidable loss of minor amounts of soils.	None.
Issue:	Soil Productivity		
Impact:	**Impact 4.3.3.3.2-3:** Soil productivity may decrease as a result of mine operations since growth media (*i.e.* salvageable surface and sub-surface soil) would be mixed during salvaging, and stockpiling activities.	Same as Proposed Action, however implementation of this alternative would disturb 486 fewer acres than the Proposed Action.	No impact.
Level of Significance:	Less than significant.	Less than significant.	Not applicable.
Mitigation Measures:	None.	None.	None.
Residual Impact:	None.	None.	None.
		WATER RESOURCES - GROUND WATER RESOURCES	
Issue:	Surface Water - Alteration of Flood Runoff Patterns by Surface Disturbance		
Impact:	**Impact 4.4.3.3.1-1:** Grading, earth moving, diversion of drainages, and placement of fill could accelerate erosion, sedimentation, and alter surface water flood runoff patterns during mining and post-closure.	Same as Proposed Action.	No impact.
Level of Significance:	Less than significant.	Less than significant	Not applicable.
Mitigation Measures:	None.	None.	None.
Residual Impact:	None.	None.	None.
Issue:	Surface Water - Effect of Drawdown Dewatering on Streams and Springs		
Impact:	**Impact 4.4.3.3.1-2:** Mine dewatering is not expected to affect flows in streams. The predicted drawdown under the Proposed Action, and the Partial Backfill and Injection options, at inventoried springs is predicted to be more than 10 feet at three springs at 20 years after the end of mining. The Water Delivery to Private Land Option would similarly impact the three springs identified above plus tow additional springs at 25 years after the end of mining.	Same as Proposed Action.	**Impact 4.4.3.5.1-1:** Mine dewatering would not be expected to affect flows in streams. The predicted drawdown at inventoried springs is predicted to be more than 10 feet at one spring near Rocky Pass at 20 years after the end of mining.
Level of Significance:	The impacts are potentially significant at the springs as predicted by more than 10 feet of drawdown of the valley-fill aquifer in the ground water model. One of these springs, Chillis Hot Spring, would be similarly affected by the No-Action Alternative, therefore only the potential impacts at the additional springs is attributable to the Proposed Action or options under the Proposed Action. Although significant impacts are not predicted to occur in the other individual streams, springs or spring groups, the uncertainty of predicting impacts to springs indicates a need for operational monitoring and contingent mitigation measures to be implemented if significant impacts occur. The uncertainty arises from the complex nature of ground water flow through fractured bedrock, the efficacy and ultimate locations of infiltration sites, and the assumptions used in the ground water model. If significant drawdown, reduced spring flows, or new ground water discharge areas are detected during mine operation, then mitigation measures would be implemented, as described below.	Same as Proposed Action.	Potentially significant impacts at one spring are predicted by more than 10 feet of drawdown of the valley-fill aquifer in the ground water model. Although significant impacts are not predicted to occur in the other individual streams, springs or spring groups, the uncertainty of predicting impacts to springs indicates a need for operational monitoring and contingent mitigation measures to be implemented if significant impacts occur. Impacts are considered less than significant after implementation of mitigation measures as described in the Pipeline FEIS Section 4.4.5-1 (BLM 1996a) only if the impacts are detected and mitigated prior to the end of mining. Since the significant impact to the affected spring is not predicted to occur until after the end of mining, additional mitigation such as the Proposed Action mitigation measure **4.4.3.3.1-2b** is needed to address this significant impact.

	PROPOSED ACTION	PIPELINE BACKFILL ALTERNATIVE	NO ACTION ALTERNATIVE
Mitigation Measures:	**Mitigation Measure 4.4.3.3.1-2a:** Monitoring of flows at streams and the 68 springs in the project study area would be performed as dewatering progresses to assess whether the active infiltration areas are adequate to prevent potential impacts. Monitoring locations and monitoring frequency are summarized in the Pipeline project FEIS, Appendix D (BLM 1996a). Model simulations have indicated the ability to limit the extent of drawdown in the Crescent Valley alluvial aquifer through spatial variation of infiltration site locations and recharge volumes. Over time, the actual effectiveness of infiltration for recharging the alluvial aquifer as simulated will depend, in part, on the local hydraulic characteristics of the intervening soil sequences between the individual infiltration site and the aquifer area targeted for recharge. Should seepage faces begin to form at the ground surface downgradient from an individual infiltration site, or should local flows from springs or streams diminish, the proposed infiltration sites would be enhanced or relocated. Enhancement may consist of installing trenches or vertical drains below the bottom elevation of the constructed infiltration ponds into more permeable soils, which would increase the hydraulic loading rate by which the aquifer is recharged. If monitoring shows that significant impacts are not mitigated by management of infiltration, then additional mitigation measures, including supplementing affected flows with mine water, installation of wells at spring locations, or replacement of affected water rights, would be implemented as described in the Integrated Monitoring Plan (WMC 1995b).	Same as Proposed Action.	Pipeline FEIS Section 4.4.5-1 (BLM 1996a).
	Mitigation Measure 4.4.3.3.1-2b: The impacts to springs is not predicted to occur until after the end of mining, when the operational measures described above may not be available. For the post-mining delayed impacts of drawdown, the ground water flow model would be updated during the final year of dewatering using actual field data for pumping rates, infiltration rates and locations, consumptive use, and observed drawdown to re-evaluate drawdown predictions that would occur after the end of mining. Streams and springs that are indicated to be significantly affected would be mitigated by one or more of the following measures, subject to approval of BLM and NDWR: • Replacement or purchase of the affected water right by the applicant. • Installation of a well and pump at affected spring locations to restore the historical yield of the spring. • Posting of an additional bond to provide for potentially affected water supplies in the future.	Same as Proposed Action.	Same as Proposed Action .
Residual Impacts:	None.	None.	None.
Issue:	Ground Water - Evaporative Losses		
Impact:	**Impact 4.4.3.3.1-3:** Consumptive use of water by evaporation during mining and delivery of water to the Dean Ranch would support a beneficial use, would not be expected to adversely impact water resources, and CGM would have adequate water rights to cover the consumptive use. Evaporation of 1,246 acre-feet per year from the post-mining pit lake would continue into the foreseeable future after the mine has closed.	Consumptive use of water during mine operations would be similar to the Proposed Action. After mining there would be less evaporation from the pit lake for the Backfill Alternative (766 acre-feet/yr) than for the Proposed Action (1,246 acre-feet/year).	**Impact 4.4.3.5.1-2:** Consumptive use of water by evaporation during mining supports a beneficial use, and would not be expected to adversely impact water resources or water rights. Evaporation of approximately 534 acre-feet/year from the post-mining pit lake would continue into the foreseeable future after the mine closed.
Level of Significance:	Impacts during the active mine life are less than significant. After mining, direct impacts of evaporation do not result in significant impacts, although the long-term consumptive use of water resources that do not contribute to a beneficial use is considered to be a significant impact for which there are no mitigation measures that appear to be feasible.	Same as Proposed Action.	Same as Proposed Action.
Mitigation Measures:	None feasible.	None feasible.	None feasible.
Residual Impacts:	Evaporation of water from the post-mining pit lake is estimated to amount to 1,246 acre-feet per year.	Evaporation of water from the post-mining pit lake is estimated to amount to 766 acre-feet per year.	Evaporation of water from the post-mining pit lake is estimated to amount to 534 acre-feet per year.
Issue:	Ground Water - Impacts to Water Rights		
Impact:	**Impact 4.4.3.3.1-4:** There are no active water rights that are within the predicted area of the modeled 10-foot drawdown of the valley-fill aquifer that are not otherwise predicted to be significantly affected by the No Action Alternative.	Same as Proposed Action.	**Impact 4.4.3.5.1-3:** Water rights that are within the predicted area of the modeled 10-foot drawdown of the valley-fill aquifer include two active wells and four inactive wells.

	PROPOSED ACTION	PIPELINE BACKFILL ALTERNATIVE	NO ACTION ALTERNATIVE
Level of Significance:	Impacts to the inactive wells are not considered significant until such time as the water rights holder chooses to utilize his rights, at which time they would be considered potentially significant. The impacts would become less than significant after implementation of the following mitigation measures. The significant impacts to three active water supply wells are attributed to the No-Action Alternative and would become less than significant after implementation of the following mitigation measures.	Same as Proposed Action.	Impacts to the inactive wells are considered potentially significant. Impacts of the drawdown on water rights at two active wells are significant. Application of mitigation measure 4.4.5-2 from the Pipeline FEIS would reduce the impacts to less than significant only during the period of active mine dewatering. Since the impacts of drawdown are not predicted to reach the significance threshold until up to 20 years after the end of dewatering, additional mitigation such as the Proposed Action mitigation measure 4.4.3.3.2-2b would be needed to address the post-mining impacts to wells and water rights.
Mitigation Measures:	**Mitigation Measure 4.4.3.3.1-4a:** If regional monitoring shows impacts on water users other than the applicant, impacts should be mitigated by optimizing dewatering well pumping rates and relocation or addition of infiltration ponds. In the event that drawdown effects on water rights users other than the applicant cannot be mitigated based on compliance with applicable Nevada water laws and regulations, the applicant would supplement these users' needs with the appropriate permits from the State for use of water for other than mining.	Same as Proposed Action.	Pipeline FEIS (BLM 1996a) Section 4.4.5-2.
	Mitigation Measure 4.4.3.3.1-4b: For the significant impacts to wells that are not predicted to occur until after the end of mining, the operational measures described above may not be available. For the post-mining delayed impacts of drawdown, the ground water flow model would be updated during the final year of dewatering using actual field data for pumping rates, infiltration rates and locations, consumptive use, and observed drawdown to re-evaluate drawdown predictions that would occur after the end of mining. Wells with active water rights that are indicated to be significantly affected would then be mitigated by one or more of the following measures, subject to approval of BLM and NDWR: • Replacement or purchase of the affected water right by the applicant. • Installation of a deeper well and pump at affected locations to restore the historical yield of the well. • Posting of an additional bond to provide for potential future impacts to potentially affected water supplies.	Same as Proposed Action.	Same as Proposed Action.
Residual Impacts:	None.	None.	None.
Issue:	Ground Water - Ground Water Flow to the Humboldt River		
Impact:	**Impact 4.4.3.3.1-5:** Ground water flow modeling indicates that a slight reduction of ground water flow from Crescent Valley to the Humboldt River would occur.	Same as Proposed Action.	**Impact 4.4.3.5.1-4:** Ground water flow modeling indicates that a reduction of 140 acre-feet per year ground water flow from Crescent Valley to the Humboldt River would occur.
Level of Significance:	Less than significant.	Less than significant.	Less than significant.
Mitigation Measures:	None.	None.	None.
Residual Impacts:	None.	None.	None.
Issue:	Ground Water - Potential Impacts to Aquifer Productivity due to Subsidence		
Impact:	**Impact 4.4.3.3.1-6:** Ground subsidence of up to about 0.5 feet would occur at a distance of 4 miles southeast of the pit on the eastern edge of the project area. The subsidence would result primarily from a permanent reduction in porosity in the finer grained sediments (clays and silty clays), which are not the primary water-bearing materials in the alluvial aquifer.	Same as Proposed Action.	Not analyzed.
Level of Significance:	Less than significant.	Less than significant.	Not applicable.
Mitigation Measures:	None.	None.	None.
Residual Impacts:	None.	None.	None.

	PROPOSED ACTION	PIPELINE BACKFILL ALTERNATIVE	NO ACTION ALTERNATIVE
Issue:	Water Quality - Water Quality Degradation Due to Drainage From Ore Stockpiles and Waste Rock		
Impact:	**Impact 4.4.3.3.1-7:** There is a low potential for impacts to surface water and ground water quality due to drainage from stockpiled ore and waste rock piles.	Same as Proposed Action.	No impact.
Level of Significance:	Less than significant.	Less than significant.	Not applicable.
Mitigation Measures:	None.	None.	None.
Residual Impacts:	None.	None.	None.
Issue:	Water Quality - Pit Lake Water Quality		
Impact:	**Impact 4.4.3.3.1-8:** The predicted pit water quality would initially be good. With time, evapoconcentration is predicted to increase constituent concentrations, eventually exceeding enforceable drinking water standards approximately 190 years after the end of mining (90 years under the Partial Backfill Option). As evaporation concentrates pit waters over time, the quality would generally resemble that of natural closed basin lakes in an arid climate. Acidic mine waters are not predicted to develop. Potential migration of pit waters into the adjacent aquifers would not occur until a hydraulic steady-state condition is approached, beyond 250 years after the end of mining.	**Impact 4.4.3.4.1-1:** The predicted pit water quality would initially be good. With time, evapoconcentration is predicted to increase constituent concentrations, eventually exceeding enforceable drinking water standards approximately 100 years after the end of mining. As evaporation concentrates pit waters over time, the quality would generally resemble that of natural closed basin lakes in an arid climate. Acidic mine waters are not predicted to develop. Potential migration of pit waters into the adjacent aquifers would not occur until hydraulic steady-state was reached, beyond 250 years after the end of mining.	**Impact 4.4.3.5.1-5:** As with the Proposed Action, the predicted pit water quality would initially be good. With time, evapoconcentration is predicted to increase constituent concentrations, eventually exceeding enforceable drinking water standards ate some time more than 250 years after the end of mining (*i.e.* beyond the modeled time frame). As evaporation concentrates pit waters over time, the quality would generally resemble that of natural closed basin lakes in an arid climate. Acidic mine waters are not predicted to develop. Potential migration of pit waters into the adjacent aquifers would not occur until hydraulic steady-state was reached, beyond 250 years after the end of mining.
Level of Significance:	The significance of pit water quality impacts is time dependant. Over the normal time frame of post-closure monitoring and maintenance (30 years), impacts are less than significant. Long-term impacts are considered to be potentially significant because of the increasing uncertainty of extending predictions into the future.	As with the Proposed Action, the significance of pit water quality impacts is time dependant. Over the normal timeframe of post-closure monitoring and maintenance (30 years), impacts are less than significant. As discussed under Impact 4.4.3.3.3-2, long-term impacts are considered to be potentially significant and no mitigation measures appear to be feasible.	As with the Proposed Action, the significance of pit water quality impacts would be time dependant. Over the normal time frame of post-closure monitoring and maintenance (30 years), impacts would be less than significant. As discussed under impact 4.4.3.3.3-2, long-term impacts would be considered to be potentially significant.
Mitigation Measures:	No mitigation measures appear to be feasible for potential long-term impacts, however a long-term contingency fund has been established by CGM and BLM (see Pipeline FEIS, Section 2.2.8). This fund will be used at the BLM's discretion for long-term monitoring, and to provide for a program of corrective action, using the best available technology, should long-term monitoring indicate the need to take such action.	Same as Proposed Action.	Same as Proposed Action.
Residual Impact:	Initial water quality of the pit lake would be good, meeting Nevada Drinking Water Standards. Within about 190 years, it is predicted that evapoconcentration would result in exeedances of these standards. Eventually, (over thousands of years) pit water quality would approach that of natural saline lakes and may begin to affect water quality in adjacent alluvial aquifers. After 250 years, the TDS of the pit lake is predicted to be 1,056 mg/L.	Initial water quality of the pit lake would be good, meeting Nevada Drinking Water Standards. Within about 100 years, it is predicted that evapoconcentration would result in exeedances of these Standards. Eventually, (over thousands of years) pit water quality would approach that of natural saline lakes and may begin to affect water quality in adjacent alluvial aquifers. After 250 years, the TDS of the pit lake is predicted to be 1,199 mg/L.	Initial water quality of the pit lake would be good, meeting Nevada Drinking Water Standards. It is predicted that after 250 years, the pit water quality would still be within the enforceable Nevada Drinking Water Standards, with a TDS predicted to be 792 mg/L. At some extended time of more than 250 years, it is expected that evapoconcentration would result in exeedances of these standards. Eventually, (over thousands of years) pit water quality would approach that of natural saline lakes and may begin to affect water quality in adjacent alluvial aquifers.
Issue:	Water Quality - Ground Water Quality in the Reinfiltration Areas		
Impact:	**Impact 4.4.3.3.1-9:** It is possible that infiltrated water may temporarily exceed the Nevada water quality standards for selected constituents as a result of either poor quality of pumped ground water or dissolution of saline soils beneath the infiltration ponds.	Same as Proposed Action.	It is possible that infiltrated water may temporarily exceed the Nevada water quality standards for selected constituents as a result of either poor quality of pumped ground water or dissolution of saline soils beneath the infiltration ponds.
Level of Significance:	This impact is considered potentially significant. The following mitigation measures would reduce the impact to less than the level of significance.	Same as Proposed Action.	This impact is considered potentially significant. The following mitigation measures would reduce the impact to less than the level of significance.
Mitigation Measures:	**Mitigation Measure 4.4.3.3.1-9a:** In the event monitoring shows that reinfiltration water is of sufficiently poor quality to degrade ground water beneath the infiltration ponds (*e.g.*, raise TDS levels to greater than applicable standards for existing or potential beneficial uses), then mitigation measures would include chemical pretreatment such as flocculation basins to reduce TDS in water flowing into infiltration areas.	Same as Proposed Action.	**Mitigation Measure 4.4.3.5.1-6a:** In the event monitoring shows that reinfiltration water is of sufficiently poor quality to degrade ground water beneath the infiltration ponds (*e.g.*, raise TDS levels to greater than applicable standards for existing or potential beneficial uses), then mitigation measures would include chemical pretreatment such as flocculation basins to reduce TDS in water flowing into infiltration areas.

	PROPOSED ACTION	PIPELINE BACKFILL ALTERNATIVE	NO ACTION ALTERNATIVE
	Mitigation Measure 4.4.3.3.1-9b: If ground water quality is degraded by infiltration through saline soils in the vadose zone, then the following mitigation measures would be undertaken: • The bottom surface of individual basins within the source infiltration area would be modified by installation of trenches or borings intended to provide access to deeper coarse-grained alluvial sequences underlying the site. The trenches and borings would be backfilled with clean gravel to provide wall stability and promote vertical drainage, resulting in a more direct flow path to the body of receiving water and would decrease contact time with the upper, fine-grained minerals, the source of mobilized salts. • Alternative reinfiltration sites would be used. • Implementation of the Injection Well Option (described in Section 3.3.2.2) may also be used to avoid impacts associated with infiltration through saline soils.		**Mitigation Measure 4.4.3.5.1-6b:** If ground water quality is degraded by infiltration through saline soils in the vadose zone, then the following mitigation measures would be undertaken: • The bottom surface of individual basins within the source infiltration area would be modified by installation of trenches or borings intended to provide access to deeper coarse-grained alluvial sequences underlying the site. The trenches and borings would be backfilled with clean gravel to provide wall stability and promote vertical drainage, resulting in a more direct flow path to the body of receiving water and would decrease contact time with the upper, fine-grained minerals, the source of mobilized salts. • Alternative infiltration sites would be used.
Residual Impacts:	None.	Same as Proposed Action.	None.
	AIR RESOURCES		
Issue:	Fugitive Dust		
Impact:	**Impact 4.5.3.3.1-1:** Fugitive dust (PM_{10}) would be generated by numerous processes as a result of the Proposed Action, including the resuspension of road dust, wind erosion of exposed dirt surfaces, and activities related to the processing of ore materials. These activities are inherent to the mining process and would be ongoing throughout the life of the Proposed Action. The modeled PM_{10} concentrations show levels below the SAAQS and the NAAQS, even with the addition of a site-specific background concentration of $22\mu g/m^3$.	Less than Proposed Action.	No impact.
Level of Significance:	Less than significant.	Less than significant.	Not applicable.
Mitigation Measures:	None.	None.	None.
Residual Impact:	None.	None.	None.
Issue:	Combustion Emissions		
Impact:	**Impact 4.5.3.3.1-2:** Combustion emissions of CO, NO_2 and SO_2 would be generated by numerous processes as a result of the Proposed Action, including combustion emissions from diesel engines; and, burning propane, fuel oil, and/or coal in various process equipment. The modeled CO, NO_2 and SO_2 concentrations show levels well below the SAAQS and the NAAQS.	Less than Proposed Action..	No impact.
Level of Significance:	Less than significant.	Less than significant.	Not applicable.
Mitigation Measures:	None.	None.	None.
Residual Impact:	Combustion emissions of CO, NO_2 and SO_2 would be generated by numerous processes as a result of the Proposed Action, including combustion emissions from diesel engines; and, burning propane, fuel oil, and/or coal in various process equipment.	Same as Proposed Action.	None.
	RANGE RESOURCES		
Issue:	Loss of Animal Unit Months (AUMs)		
Impact:	**Impact 4.6.3.3.1-1:** Mine development and operation would result in the temporary loss of 352 AUMs.	**Impact 4.6.3.4.1-1:** Mine development and operation would result in the temporary loss of 304 AUMs.	No impact.
Level of Significance:	Less than significant.	Less than significant.	Not applicable.
Mitigation Measures:	None.	None.	None.
Residual Impact:	None.	None.	None.

	PROPOSED ACTION	PIPELINE BACKFILL ALTERNATIVE	NO ACTION ALTERNATIVE
Impact:	**Impact 4.6.3.3.1-2:** Mine development and operation would result in the permanent loss of 36 AUMs.	**Impact 4.6.3.4.1-2:** Mine development and operation would result in the permanent loss of 20 AUMs.	No impact.
Level of Significance:	Less than significant.	Less than significant.	Not applicable.
Mitigation Measures:	None.	None.	None.
Residual Impact:	The permanent loss of 36 AUMs.	The permanent loss of 20 AUMs.	None.
	NOXIOUS WEEDS		
Issue:	Introduction or Spread of Noxious Weeds into Disturbed Areas		
Impact:	**Impact 4.7.3.3.1-1:** The salvaging and stockpiling of soil, and the subsequent use of the soil for reclamation, could result in a possible expansion of whitetop within the Project Area. Other disturbed surfaces would be suitable for whitetop establishment.	Same as Proposed Action.	No impact.
Level of Significance:	This impact is considered potentially significant. The following mitigation measures are provided which would reduce the adverse effects of the impact to below the level of significance.	Potentially significant.	Not applicable.
Mitigation Measures:	**Mitigation Measure 4.7.3.3.1-1:** The control measures targeted at minimizing the establishment of whitetop on the soil stockpiles and other disturbed sites as stated within the noxious weed monitoring and control plan would be applied. Reclaimed areas would be monitored annually until the reclamation bond was released.	Same as Proposed Action.	None.
Residual Impact:	None.	None.	None.
Impact:	**Impact 4.7.3.3.1-2:** The percolation of water into the alluvium creates local, near surface soil water moisture conditions conducive to saltcedar establishment and spread. Due to increased ponded water and local areas of surface saturation, and traffic on an off the Project Area, saltcedar could expand to areas outside the Project Area. Adverse effects to native plant communities would probably occur.	Same as Proposed Action.	No impact.
Level of Significance:	This impact is considered potentially significant. The following mitigation measures are provided which would reduce the adverse effects of the impact to below the level of significance.	Potentially significant.	Not applicable.
Mitigation Measures:	**Mitigation Measure 4.7.3.3.1-2:** The control measures targeted at controlling the establishment of saltcedar as stated within the noxious weed monitoring and control plan would be applied. A monitoring program would be conducted for at least five years.	Same as Proposed Action.	None.
Residual Impact:	None.	None.	None.
Impact:	**Impact 4.7.3.3.1-3:** Noxious weeds may be introduced to the Project Area as an indirect result of mining construction and operation. Surface disturbance creates an environment conducive to supporting weed species. The use of construction equipment from outside areas provides a transport means for noxious weed seed into and throughout the Project Area.	Same as Proposed Action.	No impact.
Level of Significance:	This impact is considered potentially significant. The following mitigation measures are provided which would reduce the adverse effects of the impact to below the level of significance.	Potentially significant.	Not applicable.
Mitigation Measures:	**Mitigation Measure 4.7.3.3.1-3:** The monitoring measures as stated in the noxious weed monitoring and control plan would be applied. The presence of all weed species shall be recorded, and new infestations managed appropriately.	Same as Proposed Action.	None.
Residual Impact:	None.	None.	None.

	PROPOSED ACTION	PIPELINE BACKFILL ALTERNATIVE	NO ACTION ALTERNATIVE
		VEGETATION RESOURCES	
Issue:	General Removal of Vegetation		
Impact:	**Impact 4.8.3.3.1-1:** Vegetation would be removed as a result of the construction and operation of the Project. The Proposed Action would result in an additional 4,450 acres of disturbance over and above the currently approved mining-related activities. The total is cumulative and would never be reached at any point in time since disturbance would be conducted incrementally and reclamation would begin upon completion of activities at each disturbed site. Reclamation would be completed for 3,845 acres or 86 percent of the disturbed area. Approximately 605 acres of vegetation in the vicinity of the open pit would be removed and not reclaimed.	**Impact 4.8.3.4.1-1:** Vegetation would be removed as a result of the construction and operation of the Project. The Pipeline Backfill Alternative would result in an additional 3,841 acres of disturbance over and above the currently approved mining-related activities. The total is cumulative and would never be reached at any point in time since disturbance would be conducted incrementally and reclamation would begin upon completion of activities at each disturbed site. Reclamation would be completed for 3,238 acres or 84 percent of the disturbed area (Section 3.8). In addition, 276 acres of approved disturbance associated with the Pipeline project would be reclaimed following backfilling of the Pipeline open pit - an area that was not able to be reclaimed under the Proposed Action or as part of the Pipeline project. Approximately 254 acres of vegetation in the vicinity of the South Pipeline open pit would be removed and not reclaimed.	No impact.
Level of Significance:	Less than significant.	Less than significant.	Not applicable.
Mitigation Measures:	None.	None.	None.
Residual Impact:	The Proposed Action would result in the unavoidable loss of up to 605 acres of vegetation resulting from surface disturbance in the open pit area. Approximately 3,845 acres of vegetation would be removed and reclaimed as a result of mine development, operation, and closure.	The Backfill Alternative would result in the unavoidable loss of up to 254 acres of vegetation resulting from surface disturbance in the open pit area. Approximately 3,361 acres of vegetation would be removed and reclaimed as a result of mine development, operation, and closure.	None.
Issue:	Modification of Vegetation Community Structure		
Impact:	**Impact 4.8.3.3.1-2:** Vegetation removal and subsequent reclamation efforts would result in the conversion from a shrub-dominated community to a grass/forb-dominated community in the short-term. The removal of mature shrubs would be a long-term impact since it would take approximately 15 to 20 years after reclamation to re-establish mature shrubs in the Project Area.	Same as Proposed Action.	No impact.
Level of Significance:	Less than significant.	Less than significant.	Not applicable.
Mitigation Measures:	None.	None.	None.
Residual Impact:	The reclaimed plant community may have a modified structure in comparison with undisturbed vegetation due to the absence of mature shrubs for a period of 15 to 20 years.	Same as Proposed Action.	None.
Issue:	Water Table Drawdown		
Impact:	**Impact 4.8.3.3.1-3:** Approximately 2,000 to 3,000 acres of phreatophyte vegetation would potentially experience mortality due to the water table drawdown associated with mine dewatering and subsequent filling of the open pit. The affected area represents approximately six to nine percent of the existing area of greasewood phreatophytes.	Same as Proposed Action.	No impact.
Level of Significance:	This impact is considered less than significant and no mitigation measures are required.	Less than significant.	Not applicable.
Mitigation Measures:	None.	None.	None.
Residual Impact:	Approximately 2,000 to 3,000 acres of phreatophyte vegetation will potentially experience mortality as a result of water table drawdown and will not become re-established until the aquifer recovers to its original levels. The affected area represents approximately six to nine percent of the existing area of greasewood phreatophytes.	Same as Proposed Action.	None.
Issue:	Particulate Deposition on Vegetation		
Impact:	**Impact 4.8.3.3.1-4:** Vegetation in the immediate vicinity of Project Area could suffer periodic short-term reductions in primary production due to airborne particulate deposition onto exposed surfaces.	Same as Proposed Action.	No impact.
Level of Significance:	Less than significant.	Less than significant.	Not applicable.

	PROPOSED ACTION	PIPELINE BACKFILL ALTERNATIVE	NO ACTION ALTERNATIVE
Mitigation Measures:	None.	None.	None.
Residual Impact:	None.	None.	None.
Issue:	Impacts to Special Status Species		
Impact:	**Impact 4.8.3.3.1-5:** Suitable habitat may be lost for Eastwood's milkweed and Elko rockcress, both BLM Sensitive species, as a result of construction and operation of the Project.	Same as Proposed Action.	No impact.
Level of Significance:	Less than significant.	Less than significant.	Not applicable.
Mitigation Measures:	None.	None.	None.
Residual Impact:	None.	None.	None.
		WILDLIFE AND FISHERIES RESOURCES	
Issue:	General Removal of Wildlife Habitat		
Impact:	**Impact 4.9.3.3.1-1:** Approximately 4,450 acres of wildlife habitat over the currently approved number of acres, would be directly removed as a result of implementation of the Proposed Action. Due to incremental reclamation, this acreage figure would never be disturbed all at one time. Upon completion, the reclamation portion of the Proposed Action would be completed for 3,845 acres or 86 percent of the disturbed area (Section 3.7). Approximately 605 acres of wildlife habitat in the vicinity of the open pit would be removed and not reclaimed.	**Impact 4.9.3.4.1-1:** Approximately 3,841 acres of wildlife habitat would be altered as a result of the construction and operation of this alternative. Reclamation would be incremental such that the entire amount of disturbance would never be reached at any point in time. Reclamation would be completed for 84 percent of the disturbed area (Section 3.7). In addition, 276 acres of approved disturbance associated with the Pipeline project would be reclaimed following backfilling of the Pipeline pit - an area that was not able to be reclaimed under the Proposed Action or as part of the Pipeline project.	No impact.
Level of Significance:	Less than significant.	Less than significant.	Not applicable.
Mitigation Measures:	None.	None.	None.
Residual Impact:	The Proposed Action would result in the unavoidable loss of up to 605 acres of terrestrial wildlife habitat resulting from surface disturbance in the open pit area. Approximately 3,845 acres of wildlife habitat would be removed in the short-term and then reclaimed as a result of mine development, operation, and closure.	The Pipeline Backfill Alternative would permanently eliminate 254 acres of terrestrial wildlife habitat.	None.
Issue:	Structural Modification of Wildlife Habitat		
Impact:	**Impact 4.9.3.3.1-2:** Modification of wildlife habitat and subsequent reclamation efforts would result in less available mature vegetation for cover, forage, and nesting habitat for many species of wildlife, in the short-term.	Same as Proposed Action.	No impact.
Level of Significance:	Less than significant.	Less than significant.	Not applicable.
Mitigation Measures:	None.	None.	None.
Residual Impact:	The reclaimed land would have more grass and forb forage and less mature shrub forage in the short-term. Rabbits, hawks, and rodents would benefit the most from the early seral stage vegetation in the short-term. As the plant community matures, within a period of 15 to 20 years, larger shrubs would provide additional cover for larger animals and less of a forage prey base for raptors, similar to the existing situation.	Same as Proposed Action.	None.
Issue:	Groundwater Drawdown		
Impact:	Refer to **Impact 4.4.3.3.1-2**.	Same as Proposed Action.	No impact.
Level of Significance:	Less than significant.	Less than significant.	Not applicable.
Mitigation Measures:	Refer to **Mitigation Measure 4.4.3.3.1-2b**.	Same as Proposed Action.	None.
Residual Impact:	None.	None.	None.

	PROPOSED ACTION	PIPELINE BACKFILL ALTERNATIVE	NO ACTION ALTERNATIVE
Issue:	Noise		
Impact:	**Impact 4.9.3.3.1-3:** Sudden loud noises such as blasts could cause wildlife to disperse in directions away from the sound. This behavior could send animals into unfamiliar terrain or towards a predator. However, since the resident animals in the area are already familiar with the noises at the existing Pipeline project, the residents are not expected to abruptly react to mining noises. Some transient wildlife would avoid the Project Area due to the noise factor.	Same as Proposed Action.	No impact.
Level of Significance:	Less than significant.	Less than significant.	Not applicable.
Mitigation Measures:	None.	None.	None.
Residual Impact:	None.	None.	None.
Issue:	Pit Lake Water Quality		
Impact:	**Impact 4.9.3.3.1-4:** The expected water quality of the proposed pit lake was modeled using an ERA process, as summarized above and in EVS (1998). The projected level of each metal in the pit lake would be below the level of significant risk to insectivorous bats and birds or other wildlife.	**Impact 4.9.3.4.1-2:** The predicted higher methylmercury concentration for the Pipeline Backfill Alternative would put the wildlife risks due to methylmercury considerably above a threshold for toxic effects.	The No Action pit lake poses less risk that the Proposed Action pit lake.
Level of Significance:	Less than significant.	Significant.	Less than significant.
Mitigation Measures:	None.	No mitigation measures appear to be feasible to reduce the level of significance of the impact. **Mitigation Measure 4.9.3.4.1-2:** Due to the uncertainty inherent in ERA's, studies shall be conducted after the pit lake forms to quantify the amount of bat and swallow use of the pit lake and to determine the magnitude of the impact.	None.
Residual Impact:	None.	The Pipeline Backfill Alternative would potentially result in acute or chronic toxicity resulting from exposure to methymercury in the pit lake based on the 250-year model results.	None.
Impact:	No Impact.	**Impact 4.9.3.4.1-3:** The larger littoral zone created by backfilling would result in higher toxicity risks to mallard and western grebe.	No impact.
Level of Significance:	Not applicable.	Less than significant.	Not applicable.
Mitigation Measures:	None.	None.	None.
Residual Impact:	None.	None.	None.
Issue:	Impacts to Special Status Species		
Impact:	**Impact 4.9.3.3.1-5:** Increased suitable habitat may be created for the Western burrowing owl as a result of construction and operation of the infiltration galleries. An increase in the number of burrowing owls in or near the Project Area may occur.	Same as Proposed Action.	No impact.
Level of Significance:	Beneficial and less than significant.	Same as Proposed Action.	Not applicable.
Mitigation Measures:	None.	None.	None.
Residual Impact:	None.	None.	None.
		CULTURAL RESOURCES	
Issue:	Undiscovered Significant Cultural Properties		
Impact:	**Impact 4.10.3.3.1-1:** Undiscovered significant cultural properties within the unsurveyed portion of the Project Area could be impacted.	Same as Proposed Action.	No impact.
Level of Significance:	Potentially significant.	Potentially significant.	Not applicable.

	PROPOSED ACTION	PIPELINE BACKFILL ALTERNATIVE	NO ACTION ALTERNATIVE
Mitigation Measures:	**Mitigation Measure 4.10.3.3.1-1:** A Class III Cultural Resources Inventory shall be completed in the unsurveyed areas prior to surface disturbing activities. If a significant cultural resource is identified as a result of the survey, the cultural resource shall be avoided.	Same as Proposed Action.	None.
Residual Impact:	None.	None.	None.
	Ethnographic Resources		
Issue:	Impacts on Springs and the Habitats They Support.		
Impact:	**Impact 4.11.3.3.1-1:** The drawdown of the water table resulting from the pit dewatering system could potentially affect surface water flow in certain streams and springs and the vegetation that is supported by the streams and springs or tapped into the water table (phreatophytes). This effect is in conflict with Newe stewardship of all resources.	Same as Proposed Action.	No impact.
Level of Significance:	This impact is considered potentially significant since more than 640 acres of vegetation may be affected.	Potentially significant.	Not applicable.
Mitigation Measures:	No mitigation measures appear feasible.	Same as Proposed Action.	None.
Residual Impact:	The potentially significant impact on streams, springs, and related ecosystems as a result of ground water drawdown in the context of the Newe stewardship of resources cannot be mitigated, even though the impacts would not be permanent.	Same as Proposed Action.	None.
	Visual Resources		
Issue:	Visibility of Proposed Mining Activities		
Impact:	**Impact 4.12.3.3.1-1:** The proposed mining activities would be visible from KOP #1, #2, and #3.	Changes to the characteristic landscape associated with implementation of the alternative to partially Backfill the Pit would not be noticeably different from those of the Proposed Action. Approximately 90 million tons of waste rock would be returned to the open pit in lieu of adding it to the waste rock dump. However, the amount of waste rock returned to the pit is minor (about 20 percent of the entire volume of the Proposed Action waste rock dump) and would not appreciably reduce contrasts in form, line and color of the waste rock dump.	No impact.
Level of Significance:	This impact is considered less than significant and no mitigation measures are required, but the following mitigation measure would reduce the adverse effects of the impact.	Less than significant.	Not applicable.
Mitigation Measure:	**Mitigation Measure 4.12.3.3.1-1:** For reducing visual contrast, minimization of disturbance is the most effective mitigation technique. Where disturbance is proposed, repetition of the basic landscape elements (form, line, color, and texture) would minimize visual change. Clearing of land for waste rock dumps and facility construction would create curvilinear boundaries instead of straight lines to minimize disturbance of the landscape. Grading would proceed in a manner that would minimize erosion and conform to the natural topography.	Same as Proposed Action.	None.
Residual Impact:	The Proposed Action would result in unavoidable but minimal additive physical change in the existing contour and character of the Project Area. These changes would be visibly most apparent over the active life of the Project, but would diminish through the completion of reclamation and revegetation activities contained as part of the proposed action. These physical changes to the area would be permanent, but would continue to lessen following the completion of final reclamation as natural processes continue to soften the line and form to match the surrounding landscape.	Same as Proposed Action.	None.
	Auditory Resources		
Issue:	Noise Related Impacts		
Impact:	**Impact 4.13.3.3.1-1:** The Proposed Action would extend the existing mining- and construction-related noise impacts, excluding blasting, which would likely not exceed 55 dBA at the sensitive receptor sites.	Same as Proposed Action.	No impact.
Level of Significance:	Less than significant.	Less than significant.	Not applicable.

	PROPOSED ACTION	PIPELINE BACKFILL ALTERNATIVE	NO ACTION ALTERNATIVE
Mitigation Measures:	None.	None.	None.
Residual Impact:	None.	None.	None.
Issue:	Blasting Activities		
Impact:	**Impact 4.13.3.3.1-2:** Blasting associated with the Proposed Action would continue at a frequency of one blast a day and estimated blasting-related noise levels would be similar to existing levels, which would likely exceed 55 dBA at two of the three sensitive receptor sites.	Same as Proposed Action.	No impact.
Level of Significance:	Potentially significant.	Potentially significant.	Not applicable.
Mitigation Measures:	**Mitigation Measure 4.13.3.3.1-2:** Blasting shall occur once per day a be no longer that 15 seconds in duration per blast. The impact would remain significant after implementation of the mitigation measure.	Same as Proposed Action.	None.
Residual Impact:	The residual adverse effects on the environment from noise generated during mining activities associated with the Proposed Action would be that blasting-related noise levels would be similar to existing levels, which would likely exceed 55 dBA at two of the three sensitive receptor sites.	Same as Proposed Action.	None.
		LAND USE, ACCESS, AND PUBLIC SAFETY	
Issue:	Removal of Public Land Utilized for Grazing		
Impact:	**Impact 4.14.3.3.1-1:** Public lands currently utilized for livestock grazing and mineral exploration would be removed from use as a result of the construction and operation of the Project. The Proposed Action would result in an additional 4,450 acres of disturbance over and above the currently approved mining-related activities. Reclamation would be completed for 3,845 acres, or 86 percent, of the disturbed area. Approximately 605 acres of public land in the vicinity of the open pit would be disturbed and not reclaimed.	**Impact 4.14.3.4.1-1:** Public lands currently utilized for livestock grazing and mineral exploration would be removed from use as a result of the construction and operation of the Project. The Pipeline Open Pit Backfill Alternative would result in an additional 3,841 acres of disturbance over and above the currently approved mining-related activities. Reclamation would be completed for 3,237 acres, or 84 percent, of the disturbed area. In addition, 276 acres of approved disturbance associated with the Pipeline project would be reclaimed following backfilling of the Pipeline open pit - an area that was not able to be reclaimed under the Proposed Action or as part of the Pipeline project. Approximately 254 acres of public land in the vicinity of the South Pipeline open pit would be disturbed and not reclaimed.	Not impact.
Level of Significance:	Less than significant.	Less than significant.	Not applicable.
Mitigation Measures:	None.	None.	None.
Residual Impact:	The Proposed Action would result in the unavoidable loss of up to 605 acres of public lands utilized for livestock grazing and mineral exploration resulting from surface disturbance associated with the South Pipeline open pit. There would be no residual adverse impact to access resulting from the Proposed Action.	The Pipeline Backfill Alternative would result in the unavoidable loss of up to 254 acres of public lands utilized for livestock grazing and mineral exploration resulting from surface disturbance in the open pit area. There would be no residual adverse impact to access resulting from the Pipeline Backfill Alternative.	None.
Issue:	Hazardous Material Spill		
Impact:	**Impact 4.14.3.3.1-2:** A spill of hazardous materials could adversely affect public safety and the environment.	Same as Proposed Action.	No impact.
Level of Significance:	This impact is considered less than significant and no mitigation measures are required, but the following mitigation measure is provided to reduce the adverse effects of this potential impact.	Less than significant.	Not applicable.
Mitigation Measures:	**Mitigation Measure 4.14.3.3.1-2:** The Project Applicant shall amend the existing SPCCP and Hazardous Material Spill and Emergency Response Plan to incorporate the new Project facilities and operations.	Same as Proposed Action.	None.
Residual Impact:	The Proposed Action would have the unavoidable indirect potential to adversely affect employee and/or public safety through the accidental spill or release of hazardous materials either during transport to the Project Area, or from activities within the Project Area. However, due to the low probability of a significant accidental hazardous materials spill or release, this unavoidable potential effect is considered less than significant.	Same as Proposed Action.	None.

	PROPOSED ACTION	PIPELINE BACKFILL ALTERNATIVE	NO ACTION ALTERNATIVE
		RECREATION AND WILDERNESS	
Issue:	Short- and Long-Term Loss of Public Lands		
Impact:	**Impact 4.15.3.3.1-1:** Public lands potentially used for dispersed recreation would be removed from use as a result of the construction and operation of the Project. The Proposed Action would result in an additional 4,450 acres of disturbance over and above the currently approved mining-related activities. Reclamation would be completed for 3,845 acres, or 86 percent, of the disturbed area. Approximately 605 acres of public land in the vicinity of the open pit would be disturbed and not reclaimed.	**Impact 4.15.3.4.1-1:** Public lands potentially used for dispersed recreation would be removed from use as a result of the construction and operation of the Project. The Pipeline Backfill Alternative would result in an additional 3,841 acres of disturbance over and above the currently approved mining-related activities. Reclamation would be completed for 3,237 acres, or 84 percent, of the disturbed area (Section 3.8). In addition, 276 acres of approved disturbance associated with the Pipeline project would be reclaimed following backfilling of the Pipeline open pit - an area that was not able to be reclaimed under the Proposed Action or as part of the Pipeline project. Approximately 254 acres of public land in the vicinity of the South Pipeline open pit would be disturbed and not reclaimed.	No impacts.
Level of Significance:	Less than significant.	Less than significant.	Not applicable.
Mitigation Measures:	None.	None.	None.
Residual Impact:	The Proposed Action would result in the unavoidable loss of up to 605 acres of public land managed for multiple uses, including dispersed recreation, resulting from surface disturbance associated with the South Pipeline open pit. There would be no residual adverse impacts on wilderness areas, WSAs, or developed recreation sites.	The Pipeline Backfill Alternative would result in the unavoidable loss of up to 254 acres of public land managed for multiple uses, including dispersed recreation, resulting from surface disturbance in the open pit area.	None.
		SOCIOECONOMIC VALUES	
Issue:	Population		
Impact:	**Impact 4.16.3.3.1-1:** The Project would continue employment of CGM's existing work force for an additional eight years, thus maintaining population stability in the study area, particularly Beowawe and Crescent Valley.	Same as Proposed Action.	No impact.
Level of Significance:	Beneficial impact.	Same as Proposed Action.	Not applicable.
Mitigation Measures:	None.	None.	None.
Residual Impact:	None.	None.	None.
Issue:	Employment		
Impact:	**Impact 4.16.3.3.1-2:** The Project may employ up to 50 short-term contractors or construction personnel during the life of the project and would continue long-term employment for the existing CGM work force (450-500 employees). It is expected that temporary and/or potential long-term employment positions could be accommodated by the study area population and there would not be a need to import employees from outside of the study area. The Project would continue to employ current CGM employees for an additional eight years, resulting in a continuance of current indirect employment, as well as direct and indirect spending in the study area and the state.	Same as Proposed Action.	**Impact 4.16.3.5.1-1:** The No Action Alternative would result in the elimination of eight additional years of payroll for 450-500 CGM employees and a local and state tax base.
Level of Significance:	Beneficial Impact.	Beneficial impact.	Significant.
Mitigation Measures:	None.	None.	None.
Residual Impact:	None.	None.	The loss of potential beneficial socioeconomic impacts associated with the Project would be residual adverse impacts by the No Action Alternative. The reduction of employment eight years earlier under the No Action Alternative would be a residual adverse impact to socioeconomic values. The Pipeline project FEIS did not identify any unavoidable adverse effects for socioeconomic values or public services.
Issues:	Demand for Local Rental Housing		
Impact:	**Impact 4.16.3.3.1-3:** The Project may increase demand for local rental housing. It is expected that the demand can be accommodated with existing housing supply.	Same as Proposed Action.	See **Impact 4.16.3.5-1**.

	PROPOSED ACTION	PIPELINE BACKFILL ALTERNATIVE	NO ACTION ALTERNATIVE
Level of Significance:	Beneficial Impact.	Beneficial impact.	Significant.
Mitigation Measures:	None.	None.	None.
Residual Impact:	None.	None.	None.
Issue:	Fiscal Issues		
Impact:	**Impact 4.16.3.3.1-4:** The Project would result in a continuation of a potential increase in revenues for the State of Nevada and Lander County.	Same as Proposed Action.	See **Impact 4.16.3.5-1**.
Level of Significance:	Beneficial impact.	Beneficial impact.	Significant.
Mitigation Measures:	None.	None.	None.
Residual Impact:	None.	None.	None.
		ENVIRONMENTAL JUSTICE EFFECTS	
Issue:	There are no Issues or Impacts with Regard to Environmental Justice.		
		PALEONTOLOGY	
Issue:	Construction Activities in Areas Containing Sensitive Paleontological Resources		
Impact:	**Impact 4.18.3.3.1-1:** During construction phases, the possibility exists that additional vertebrate fossils could be found.	Same as Proposed Action.	No impact.
Level of Significance:	This impact is considered less than significant and no mitigation measures are required, but the following mitigation measure would reduce the adverse effects of the impact.	Same as Proposed Action.	Not applicable.
Mitigation Measures:	**Mitigation Measure 4.18.3.3.1-1:** Any future paleontological discoveries shall be routinely reported to the BLM Authorized Officer for evaluation and possible mitigation.	Same as Proposed Action.	None.
Residual Impact:	None.	None.	None.

1 INTRODUCTION: PURPOSE OF AND NEED FOR ACTION

1 INTRODUCTION: PURPOSE OF AND NEED FOR ACTION

1.1 Introduction and Location

Cortez Gold Mines, Inc. (CGM) has proposed the South Pipeline Project (Project) as an expansion of the existing CGM Pipeline project and a modification of a portion of the Gold Acres Facilities. The actions associated with the Project would consist of the following: development of the South Pipeline ore deposit, which is contiguous with and encompasses the Pipeline ore deposit; construction of associated processing and heap leach facilities; and the use of a water pipeline to deliver water to private land to be consumptively used. In addition, CGM plans to conduct certain activities at the approved Cortez Facilities without modification to these facilities. The purpose of the Project is to continue to extract gold and incidental silver from mined ore within the South Pipeline Project Area (Project Area). The life of the Project (Pipeline and South Pipeline) would total approximately 18 years. The South Pipeline ore deposit would account for an additional eight years of mining and two years of processing beyond the eight years of mining and processing outlined in the Pipeline FEIS (BLM 1996a; page 2-9). All of these activities comprise the Proposed Action to be analyzed in the Environmental Impact Statement (EIS).

The Project Area is located within Township 27 North, Range 47 East (T27N, R47E) and T28N, R47E M.D.B.M. (Figure 1.1.1). It comprises 39,350 acres of public lands administered by the BLM, and fee lands. The Project Area is different from the Pipeline project area described in the Cortez Pipeline Gold Deposit Final Environmental Impact Statement (FEIS) (Bureau of Land Management [BLM] 1996a) and subsequent boundary changes for CGM exploration and infiltration activities. Figure 1.1.2 identifies the Project Area boundary relative to the Pipeline project area boundary. Even though the Project is an expansion of the Pipeline project, approvals under the Project would only be effective within the Project Area (except as specified in this EIS) and those portions of the Pipeline project area that are coincident with the Project Area. The Project Area is located within the 640-square-mile Joint Venture Area (JVA), established by Placer Dome U.S. and Kennecott Minerals, where all mineral exploration and development activities by these two companies are conducted by CGM. The Cortez Facilities are located beyond and east of the boundary of the Project Area, but within the JVA (Figure 1.1.2).

The Project is located approximately 30 miles southeast of Battle Mountain, Nevada in Lander County (Figure 1.1.1). The Project is reached by traveling from Battle Mountain on U.S. Interstate 80 (I-80) approximately 30 miles east, or from Elko, Nevada approximately 42 miles west, to the Beowawe Exit, then traveling approximately 31 miles south on Nevada State Route (SR) 306.

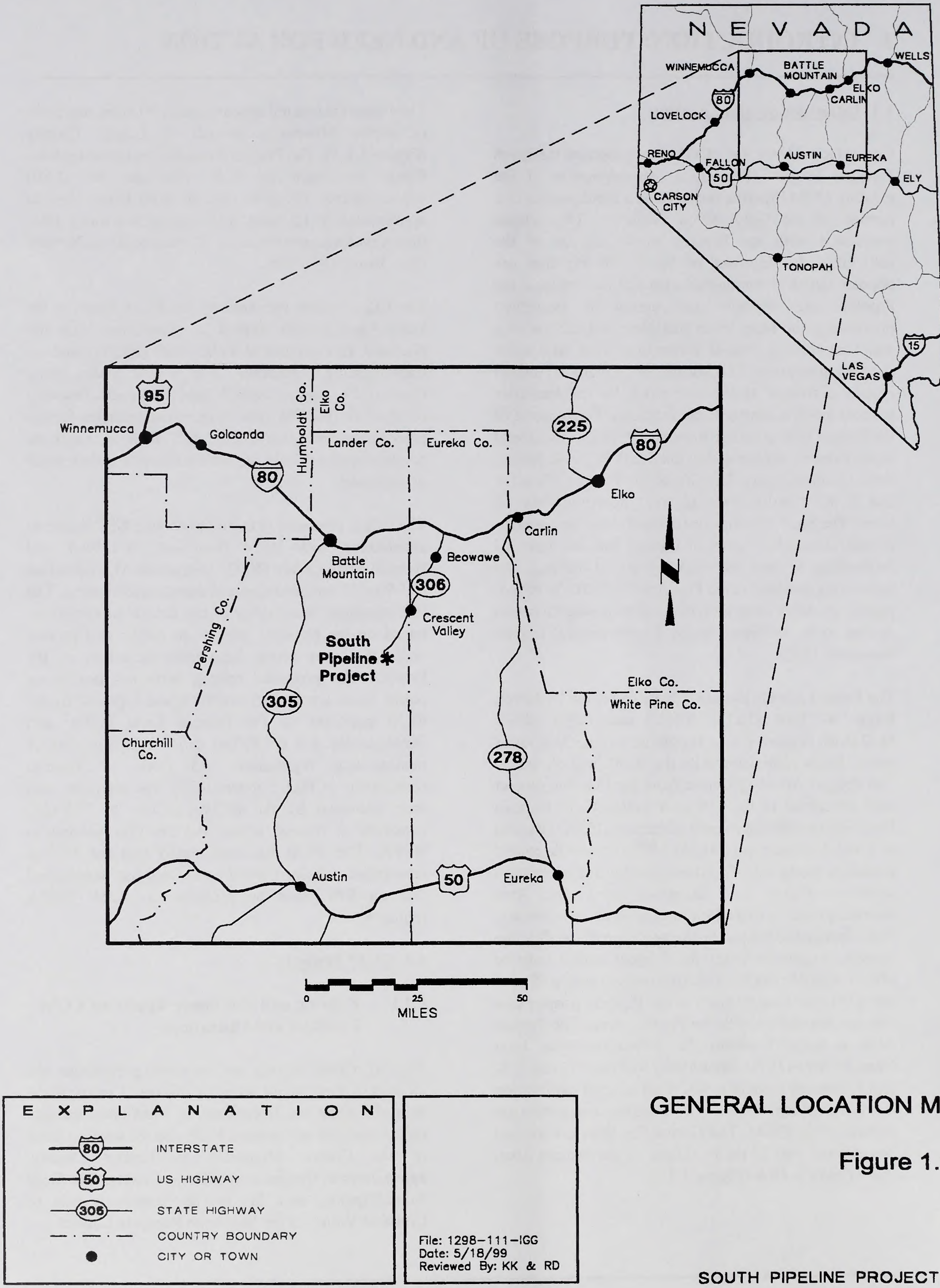
The EIS is being prepared by the BLM which is the Lead Agency with respect to compliance with the National Environmental Policy Act (NEPA) and its implementing regulations. The United States Army Corps of Engineers (USACE) and the Nevada Division of Wildlife (NDOW) are cooperating agencies for the preparation and review of the EIS. Both agencies are responsible for providing information within their areas of expertise.

The EIS is prepared in compliance with NEPA, and in accordance with BLM Handbook H-1790-1 and Nevada State Office (NSO) Instruction Memorandum NV-90-435 on the analysis of cumulative impacts. The EIS considers the quality of the natural environment based on the physical impacts to public and private lands that may result from implementation of the Project. The proposed mining activities located on public lands are subject to review and approval by the BLM pursuant to the Federal Land Policy and Management Act (FLPMA) and subsequent surface management regulations (43 Code of Federal Regulations [CFR], Subpart 3809). The activities, and their approval by the BLM pursuant to FLPMA, constitute a federal action and are thus subject to NEPA. The BLM has determined that the Project constitutes a major federal action and has determined that an EIS must be prepared to fulfill NEPA requirements.

1.2 CGM Projects

1.2.1 Existing and Previously Approved CGM Facilities and Operations

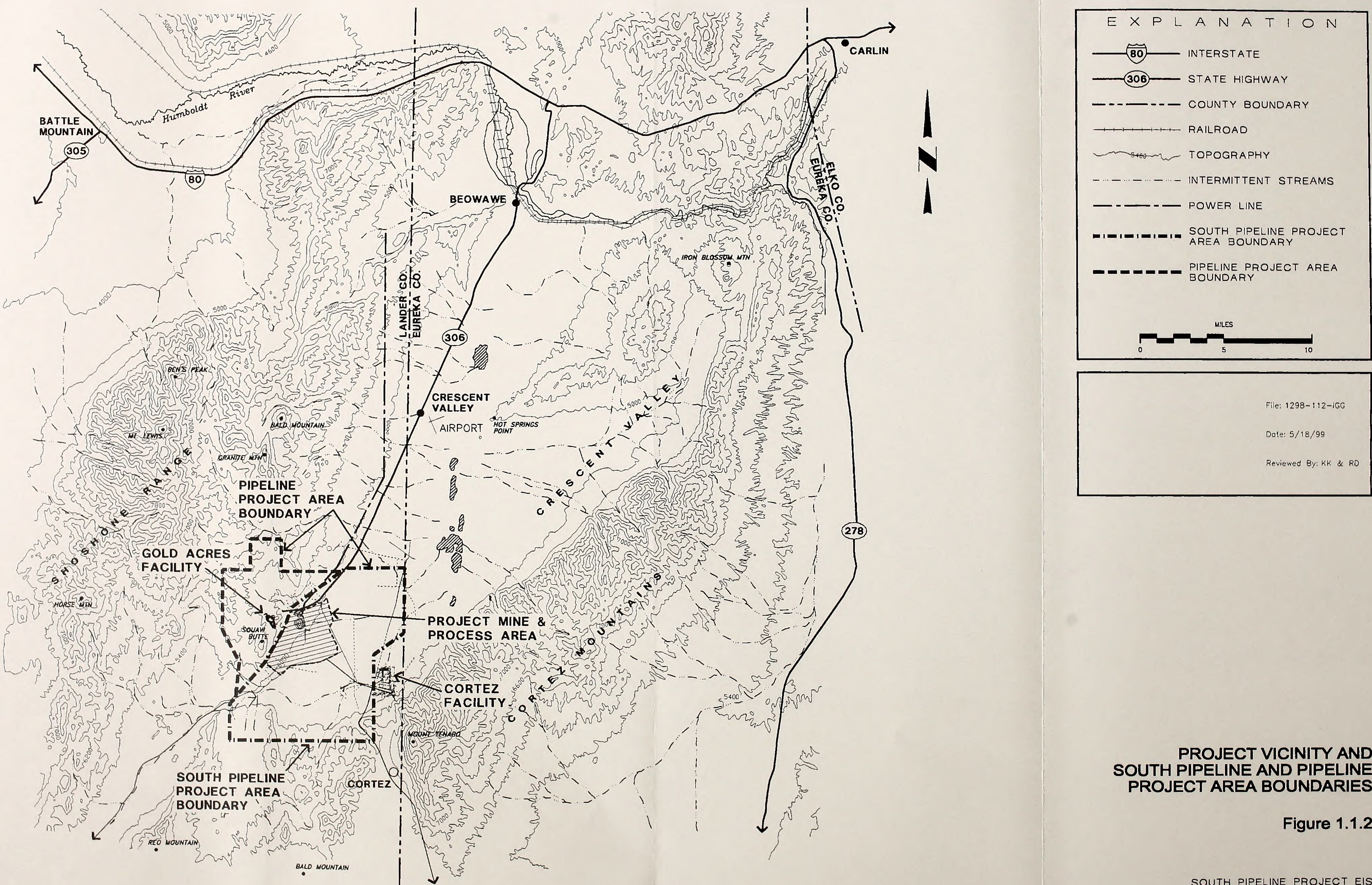
Existing CGM mining and processing facilities are located in three main areas as follows: Cortez, Gold Acres/Pipeline, and Horse Canyon. The Cortez area lies on the east side of Crescent Valley on the western flank of the Cortez Mountains in Lander County, approximately 6 miles west of Horse Canyon. The Gold Acres/Pipeline area lies on the southwest side of Crescent Valley in the Shoshone Range in Lander



GENERAL LOCATION MAP

Figure 1.1.1

SOUTH PIPELINE PROJECT EIS



PROJECT VICINITY AND SOUTH PIPELINE AND PIPELINE PROJECT AREA BOUNDARIES

Figure 1.1.2

County, approximately 8 miles northwest of the Cortez area. The Gold Acres/Pipeline area contains the Gold Acres, London Extension and Crescent open pit mines, as well as the Pipeline operations which are discussed in greater detail in Chapter 2. The Horse Canyon area is located approximately 2 miles east of Mount Tenabo in the Cortez Mountains in Eureka County. The Horse Canyon area encompasses the Horse Canyon open pit mine and an associated deposit to the south, referred to as the South Silicified Zone.

1.2.2 Proposed Action

The Project is an expansion of the existing Pipeline project and a modification of a portion of the Gold Acres Facilities. The intent of the Project is to develop the South Pipeline ore deposit and construct associated facilities to extract gold and incidental silver from the mined ore. The life of the Project would be a total of 18 years. Principal components of the Project include the South Pipeline open pit, new heap leach pads, expansion of the permitted Pipeline waste rock dump and tailings facility, and new ore and growth media stockpiles. The facilities are located within the Project Mine and Process Area (Figure 1.1.2). The Project Mine and Process Area is that portion of the Project Area where all mining activities, modifications to existing processing facilities, and new processing facilities would occur. In addition, the Pipeline mill throughput would be increased. Ground water pumping and disposal would be expected to continue for an additional eight years at a rate sufficient to allow the mining of the South Pipeline ore deposit. As a result of the Project, the operational life of CGM's mining and processing activities in the Project Area would be extended for a projected 10 years.

An estimated 150 million tons of ore would be mined from the South Pipeline open pit as part of the Proposed Action. The mined ore would be either leached on new Project heap leach pads; processed at the permitted Pipeline mill and expanded Pipeline tailings facility; or processed at the existing Cortez continuous fluid bed (CFB) roaster, carbon-in-leach (CIL) mill, and tailings facility. The approved Pipeline tailings facility would be expanded to accommodate the additional mill-grade ore from the Project. The Project waste-to-ore ratio is approximately 3:1, thus approximately 450 million tons of waste rock would be mined from the South Pipeline open pit. The Project waste rock would be placed on the approved Pipeline waste rock dump, which would be expanded as part of the Proposed Action. The Proposed Action also includes options to partially backfill the Pipeline open pit (Partial Backfill Option), to utilize injection to dispose of mine dewatering water (Injection Option), and to deliver dewatering water to private land for consumptive use (Water Delivery to Private Land Option). The Project would create a maximum of approximately 4,450 acres of new surface disturbance within the Project Area, creating a total of approximately 7,616 acres of surface disturbance associated with CGM's operations.

1.2.3 Relationship of Proposed Action to the Pipeline Project and the Crescent Pit Project

Geologically, the South Pipeline ore deposit and the Pipeline ore deposit are segments of the same mineralized system. The deposit names refer to a water pipeline that crosses the area and supplies the Gold Acres operation. For this reason, the Proposed Action would result in the Pipeline open pit and the South Pipeline open pit coalescing to form a single open pit rim as mining progressed. However, even though both ore deposits are part of the same mineralized system, the two deposits have different owners. Figure 1.2.1 shows the ownership of mineral rights in the vicinity of the Project Mine and Process Area. In the area south of the Pipeline open pit, which is the location of the South Pipeline ore deposit, the mineral rights are controlled by Royal Gold, Inc. (RGI). CGM controls the mineral rights in the area of the Pipeline ore deposit. RGI has entered into an agreement with CGM which allows CGM to develop the mineral deposits identified in the area controlled by RGI, with oversight and some control by RGI. As a result of the different ownership, two mineralized deposits, identified at approximately the same time, are being developed under two different development scenarios because of the differing informational and managerial requirements for the two companies. The difference in mineral ownership has resulted in a longer time necessary for both companies to agree that South Pipeline is an ore deposit that should be developed, as compared to the amount of time that was necessary for CGM to determine that the Pipeline ore deposit should be developed. As a result, Pipeline was proposed for development by CGM and carried through the permit and environmental review process first. During the permit and environmental review process for Pipeline, CGM and RGI came to agreement on the development of the South Pipeline ore deposit, which has resulted in the submittal, by CGM, of the *Amendment to the Pipeline Plan of Operations for the South Pipeline Project* (POO) (CGM 1996) and the subsequent preparation of this EIS.

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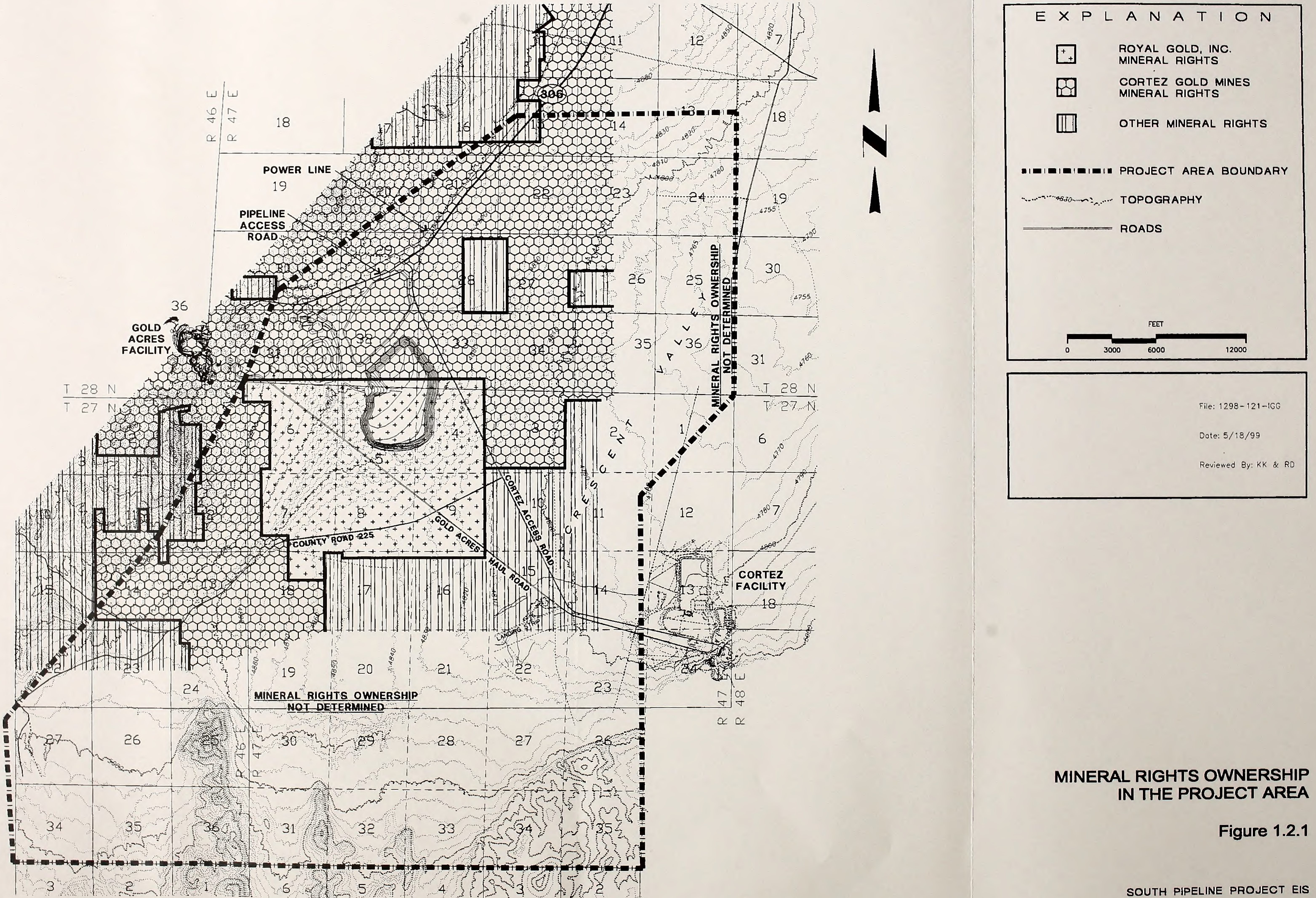

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Date: 5/18/99

Reviewed By: KK & RD

MINERAL RIGHTS OWNERSHIP IN THE PROJECT AREA

Figure 1.2.1

SOUTH PIPELINE PROJECT EIS

1.3 Purpose and Need

The BLM is responsible for administering mineral rights access on certain federal lands as authorized by the General Mining Law of 1872. Under the law, qualified prospectors are entitled to reasonable access to mineral deposits on public domain lands which have not been withdrawn from mineral entry.

The purpose of the Project is to expand the existing Pipeline project and continue to recover the gold and silver ore resources identified on mining claims which have been staked or acquired by CGM under the General Mining Law. The Project would provide sufficient ore to allow for the continued operation of the existing milling facilities currently operated by CGM. The Project would also result in a small increase in workforce and equipment needs during construction. The proposed Project does not represent a substantial change in the annual mining and production rates over those currently in place for the Pipeline project. The Project would include continued dewatering operations at a rate sufficient to allow the mining of the South Pipeline ore deposit. CGM's objective for the Project is to profitably recover precious metals (gold and incidental silver) from CGM's mining claims to the optimal extent possible and reclaim the Project Area in a manner that is environmentally responsible and in compliance with United States mining laws, FLPMA, Nevada Mine Reclamation Law, and other applicable laws and regulations. The need is to meet the prevailing market demand for gold and silver.

The purposes of the EIS are as follows: (a) to analyze the impacts of the proposed Project; (b) identify reasonable alternatives; (c) to inform the public of the Project; (d) to solicit public comment on the proposed Project and alternatives; and (e) provide agency decision makers with adequate information upon which to base the decision to approve or deny the Project or an alternative development scenario.

1.4 BLM Responsibilities and Relationship to Planning

The EIS was prepared in conformance with the policy guidance provided in BLM's NEPA Handbook (BLM Handbook H-1790-1). The BLM Handbook provides instructions for compliance with the Council on Environmental Quality (CEQ) regulations for implementing the procedural provisions of NEPA and the Department of the Interior's (DOI) manual on NEPA (516 DM 1-7).

The BLM NEPA handbook also provides guidance on monitoring. Three distinct purposes of monitoring are identified and, if the Project is approved, would be applicable:

(1) Compliance Monitoring: As part of the Record of Decision (ROD) on the Project, committed mitigation measures and related monitoring and enforcement activities, if any, for the selected alternative will be identified. Stipulations which will become part of the BLM's authorization will be attached to the ROD or incorporated by reference from this EIS or other applicable requirements. Any measures to avoid or reduce environmental harm identified in this EIS which are not adopted will also be identified with an explanation of why the measures were not adopted. NEPA requires that decisions on a project be implemented in accordance with the ROD. The BLM will perform compliance monitoring to ensure that actions taken comply with the terms, conditions, and mitigation measures identified in the ROD.

(2) Effectiveness or Success Monitoring: Determining if decisions made in the ROD are achieving intended environmental objectives may require monitoring the effectiveness or success of the actions or decisions. Effectiveness monitoring is not required by NEPA unless specified in the ROD. However, monitoring requirements specified in this EIS will be incorporated into the ROD. Effectiveness monitoring will typically be required to determine the effectiveness or success of identified mitigation measures.

(3) Evaluation of Validity Monitoring: Determining if a decision continues to be correct or appropriate over time is another purpose of monitoring. Evaluation of decision validity monitoring is not required by NEPA, and it is usually not routinely needed for all decisions covered by an EIS. Evaluation monitoring goes beyond effectiveness monitoring and focuses on examining the validity of the environmental objectives. Evaluation monitoring would be used to determine if the terms, conditions, and mitigation measures prescribed by the ROD are still needed to achieve environmental objectives or if they are greater or less than necessary to achieve environmental objectives.

Resource Management Plan:

The Proposed Action conforms with the BLM's Shoshone-Eureka Resource Management Plan (RMP) dated March 1986 (BLM 1986a). Specifically, on page 29 in the ROD of the RMP, under the heading "Minerals" subtitled "Objectives" number 1:

> "Make available and encourage development of mineral resources to meet national, regional, and local needs consistent with national objectives for an adequate supply of minerals."

Under "Management Decisions," "Locatable Materials," page 29, number 1:

> "All public lands in the planning areas will be open for mining and prospecting unless withdrawn or restricted from mineral entry."

Under "Management Decisions," number 5, Current Mineral Production Areas:

> "Recognize these areas as having a highest and best use for mineral production and encourage mining with minimum environmental disturbance..."

Surface Management Authorizations and Relevant Plans:

BLM regulations for surface management of public lands mined under the General Mining Law (43 CFR 3809) recognize the statutory right of mineral claim holders such as CGM to explore for and develop federal mineral resources and encourage such development. These federal regulations require the BLM to review proposed operations to ensure that: (a) adequate provisions are included to prevent unnecessary or undue degradation of public lands; (b) measures are included to provide for reclamation; and (c) the proposed operations comply with other applicable federal, state, and local laws and regulations. CGM has submitted to the BLM the proposed POO (CGM 1996) as required under the regulations. The CGM Plan of Operations is on file and available for review during normal business hours at the BLM's Battle Mountain Field Office.

Site Reclamation Requirements:

The Mining and Mineral Policy Act of 1970 (MMPA) mandates that federal agencies ensure that closure and reclamation of mine operations be completed in an environmentally responsible manner. The MMPA states that the federal government should promote the:

> "... development of methods for the disposal, control, and reclamation of mineral waste products, and the reclamation of mined lands, so as to lessen any adverse impact of mineral extraction and processing upon the physical environment that may result from mining or mineral activities."

The BLM's long-term reclamation goals are to shape, stabilize, revegetate, or otherwise treat disturbed areas in order to provide a self-sustaining, safe, and stable condition providing productive use of the land which conforms to the approved land-use plan for the area. The short-term reclamation goals are to stabilize disturbed areas and to protect both disturbed and adjacent undisturbed areas from unnecessary or undue degradation. Relevant BLM policy and standards for reclamation are set forth in the BLM Solid Minerals Reclamation Handbook (BLM Manual Handbook H-3042-1) which provides consistent reclamation guidelines for all solid non-coal mineral activities conducted under the authority of the BLM Minerals Regulations in Title 43 CFR (BLM 1992a). The BLM has reviewed the site reclamation portions of the CGM Project POO to ensure that the Project would meet BLM's reclamation standards and goals.

Cyanide Management Plan Requirements:

The BLM's national cyanide management policy requires that BLM state offices prepare a Cyanide Management Plan. The Nevada State Office (NSO) of the BLM prepared and administers the Nevada Cyanide Management Plan (BLM 1992b). The Nevada Cyanide Management Plan is applicable to all public lands administered by the BLM in Nevada, and it would be applicable to the Project cyanide heap leaching activities, relevant precious metal recovery processes, and expanded tailings facility. The Nevada Cyanide Management Plan provides guidance on cyanide use in mining activities and lists the following objectives:

(1) Implement the BLM's national cyanide management policy;

(2) Ensure that mining operations using cyanide on BLM managed lands follow Best Management Practices (BMPs) and do not cause unnecessary or undue degradation of the federal lands;

(3) Provide both the mine operator and the BLM technical staff with standards for development and evaluation of mining projects that use cyanide; and

(4) Use state standards, if established.

The Nevada Cyanide Management Plan is not intended to duplicate requirements of other federal or state agencies with responsibility for managing the use of cyanide in mining operations. Where standards are established for mining operations by the State of Nevada through the Nevada Division of Environmental Protection (NDEP), Bureau of Mining Regulation and Reclamation (BMRR), they shall apply when reviewing a Notice or a plan of operations. BLM has reviewed the CGM Project POO to ensure that it is in conformance with the Nevada Cyanide Management Plan.

Local Land Use Planning and Policy:

The Proposed Action is consistent with Section X of the *Lander County Policy Plan for Public Lands, Draft of 4/1/99* (Lander County 1999), which sets forth the policy to "promote the expansion of mining operations and areas." The *Lander County Policy Plan for Public Lands, Draft of 4/1/99*, also states that mine site reclamation standards should be consistent with the best possible post-mine use for each specific area, and that specific standards should be developed for each property.

1.5 Authorizing Actions

Based upon information received during the scoping process and during subsequent discussions with various agencies, certain authorizing actions have been identified as required, or probably required, prior to construction or operation of the Project. A list of these authorizing actions, organized by agency, is provided in Table 1.5.1.

1.6 Environmental Review Process

Documentation of activities conducted during the Project scoping procedure has been compiled in a Project Scoping Document which includes a summary of the issues and concerns identified during the scoping process. The Project Scoping Document identifies the key issues which the BLM decided are necessary to analyze in the EIS, and which concerns are not considered critical in terms of anticipated effects of the Proposed Action. The Scoping Document is on file and available for review during normal business hours at the BLM's Battle Mountain Field Office.

A Notice of Intent (NOI) to prepare this EIS was published in the Federal Register on November 26, 1996. The NOI invited scoping comments to be sent to the BLM through January 31, 1997. The comment period was then extended until May 23, 1997. On December 9, 1996 copies of a news release entitled "BLM To Begin South Pipeline Permitting Process" were issued statewide to newspapers, radio, television stations, and major interest groups. Public meetings were held in Battle Mountain, Nevada and Crescent Valley, Nevada. Thirty-eight individuals attended the Battle Mountain meeting on December 10, 1996. Of the 38 individuals, 13 were members of the general public. Forty-eight individuals attended the Crescent Valley meeting on December 11, 1996. Of the 48 individuals, 36 were members of the general public.

Comments recorded during these meetings and comment letters received during the public scoping period have been included in the Project Scoping Document and are on file and available for review during normal business hours at the BLM's Battle Mountain Field Office. The comments were reviewed for relevance to the Proposed Action and those which addressed potential impacts of the Proposed Action have been included in the EIS. As a result of the public scoping process the following potential Project impacts were identified by the public:

- Soils and Watershed
  Impacts from increased erosion
  Impacts to soils from a chemical release
  Impacts to the quality of soils for restoring wildlife habitats and values

- Water Resources
  Impacts to regional hydrology
  Impacts to surface waters from toxic effluents and residues
  Impacts to ground water chemistry
  Impacts to seep and springs
  Impacts to future pit water quality
  Impacts from infiltration activities
  Impacts from watering the haul roads and other consumptive uses
  Impact of subsidence from dewatering operations
  Impacts to stream flows
  Impacts to chemical composition of hot springs
  Impacts of water in the pit during mining operations
  Impacts to Waters of the United States
  Impacts to surface waters from transporting hazardous materials

Table 1.5.1: Summary of Permits and Approvals Required for the South Pipeline Project

Permit/Approval	Granting Agency
Plan of Operations	U.S. Department of the Interior, Bureau of Land Management; Nevada Department of Conservation and Natural Resources, Division of Environmental Protection, Bureau of Mining Regulation and Reclamation
Clean Water Act (CWA) Section 404 Permit	U.S. Army Corps of Engineers
Permit to Operate (Air Quality)	Nevada Department of Conservation and Natural Resources, Division of Environmental Protection, Bureau of Air Quality
Water Pollution Control Permit	Nevada Department of Conservation and Natural Resources, Division of Environmental Protection, Bureau of Mining Regulation and Reclamation
Permit for Reclamation	Nevada Department of Conservation and Natural Resources, Division of Environmental Protection, Bureau of Mining Regulation and Reclamation
Permit to Appropriate Water	Nevada Department of Conservation and Natural Resources, Division of Water Resources
Industrial Artificial Pond Permits	Nevada Department of Conservation and Natural Resources, Division of Wildlife
Approval to Operate a Sanitary Landfill	Nevada Department of Conservation and Natural Resources, Division of Environmental Protection, Bureau of Waste Management
General Discharge Permit (Stormwater)	Nevada Department of Conservation and Natural Resources, Division of Environmental Protection, Bureau of Water Pollution Control
Road Rerouting Applications	U.S. Department of the Interior, Bureau of Land Management
Hazardous Materials Storage Permit	State of Nevada, Fire Marshal Division

Impacts to the temperature of ground water which supply domestic wells
Impacts from sediment loads to streams
Loss of ground water for future development
Co-mingling of aquifers
The effects of a 24-hour/100-year storm event on the proposed mining facilities

- Air Resources
  Impacts to air quality

- Range Resources
  Impacts to range resources
  Document animal unit months (AUMs) affected by the Proposed Action

- Vegetation Resources
  Impacts to species of concern
  Impacts to wetlands and riparian ecosystems
  Impacts to vegetation from ground water depletion

- Wildlife and Fisheries Resources
  Impacts to threatened and endangered species
  Impacts to terrestrial and aquatic wildlife and habitats
  Impacts to wildlife from hazardous materials and toxic solutions
  Impacts to active bird nests
  Impacts to wildlife from Project-generated noise
  Impacts to migratory water fowl and shorebirds attracted to the infiltration facilities
  Reclamation impacts to wildlife

- Cultural Resources
  Impacts to cultural resources
  Impacts to historical places
  Impacts to prehistoric isolates

- Ethnography
  Impacts to ethnography
  Impacts to sacred springs
  Impacts to burial sites

- Geology and Paleontology
  Impacts to Pleistocene fossils
  Impacts of seismic activity on Project components

- Visual Resources
  Impacts to visual resources

- Auditory Resources
  Impacts from Project-related noise

- Land Use, Access and Public Safety
  Impacts from relocating the haul road
  Impacts to public safety
  Land ownership issues
  Impacts to local traffic

- Recreation and Wilderness
  Impacts to wilderness resources
  Impacts to wilderness study areas (WSAs)

- Socioeconomic Values and Public Services
  Impacts from employees on local economics
  Impacts to public services
  Impacts to the local housing supply
  Impacts on economics in Lander County
  Impacts on economics of State of Nevada
  Impacts to schools in Crescent Valley
  Impacts to Crescent Valley Fire Department

All of the identified issues or potential Project impacts are addressed in the Project Scoping Document and/or the EIS.

The BLM is required to assess impacts to a number of critical elements of the natural environment, as discussed in Chapter 4. Those elements that do not occur in the Project Area and would not be affected are not discussed further in this EIS. These elements that are not discussed are: prime and unique farmland, areas of critical environmental concern, and wild and scenic rivers. The elimination of nonrelevant issues follows the CEQ policy as stated in 40 CFR 1500.4.

1.7 Organization of the Environmental Impact Statement

The EIS generally follows CEQ-recommended organization (40 CFR 1508.9):

- Chapter 1 provides an introduction, purpose and need for the Proposed Action, applicable regulatory requirements and coordination, and organization of the EIS;

- Chapter 2 describes existing facilities;

- Chapter 3 describes the Proposed Action and Alternatives;

- Chapter 4 describes the affected environment, environmental consequences, and mitigation;

- Chapter 5 describes cumulative impacts;

- Chapter 6 summarizes consultation and coordination for preparation of the EIS;
- Chapter 7 presents the list of preparers;
- Chapter 8 is a list of acronyms and a glossary;
- Chapter 9 is a list of references; and
- Chapter 10 is an index.

Copies of supporting documents are on file and available for review during normal business hours at the BLM's Battle Mountain Field Office.

2 EXISTING FACILITIES

2 EXISTING FACILITIES

2.1 Introduction

The Proposed Action would utilize the approved facilities within the Project Area that are associated with the Pipeline project, the Crescent open pit, Cortez Facilities, and Gold Acres. The facilities include the Pipeline open pit, Crescent open pit, Pipeline dewatering and infiltration systems, Pipeline mill, Pipeline tailings and heap leach facility, Gold Acres heap leach facility, Pipeline waste rock dump, Crescent waste rock dump, Cortez gravel pit, and Pipeline support facilities. In addition, the Proposed Action would utilize certain components of the Cortez Facilities which are located east of the Project Area but within the Joint Venture Area (JVA). The facilities include the Cortez continuous fluid bed (CFB) roaster, Carbon-in-leach (CIL) mill, tailings facility, and the Cortez support facilities. Approved plans of operations and environmental analysis documents for previous Cortez Gold Mines (CGM) development and exploration activities in the vicinity of the Proposed Action, including the CGM facilities associated with the Proposed Action, are summarized in Table 2.1.1. Information about the facilities associated with the Proposed Action is summarized in the following sections. Information concerning the Pipeline project facilities is incorporated herein by reference from the Cortez Pipeline Gold Deposit (Pipeline) Final Environmental Impact Statement (FEIS) (Bureau of Land Management [BLM] 1996a; pages 2-1 through 2-67). Information concerning the infiltration operations associated with the Pipeline project is incorporated herein by reference from the Pipeline Infiltration Project Environmental Assessment (EA) (BLM 1999; pages 2-1 through 2-18). Information about the Crescent open pit is incorporated herein by reference from the Crescent Pit Environmental Assessment (BLM 1994; pages 2-1 through 2-20). Information on the components of the Cortez facility is taken from the Pipeline project FEIS and the Cortez Gold Mine Expansion Project Draft Environmental Impact Statement (DEIS) (BLM 1992c; pages 2-1 through 2-75), which is also incorporated by reference.

Surface disturbance associated with the approved Pipeline, Crescent and Gold Acres facilities, which are located within the Pipeline project area, totals 3,166 acres as outlined in Table 2.1.2. The projected life of the Pipeline mining and processing operations is eight years after process plant commissioning (BLM 1996a; page 1-2), or through the year 2004.

2.2 Approved Open Pits

Both the Pipeline open pit and the Crescent open pit are located within the Project Area (Figure 2.2.1). Mining of the Crescent open pit, located immediately south of the Pipeline open pit and approved under the Crescent Pit EA (BLM 1994), has been completed. Mining of the Pipeline open pit is currently ongoing at a rate of up to 250,000 tons per day (tpd). Approved surface disturbance for the Pipeline and Crescent open pits is approximately 276 and 54 acres, respectively (Figure 2.2.2 and Table 2.1.2).

2.3 Approved Mine Dewatering and Water Disposal Operations

Under the Pipeline project, CGM is conducting dewatering operations at a sufficient capacity to allow for the mining of the Pipeline ore deposit. The approved mine dewatering and water disposal operations consist of a series of dewatering wells and infiltration facilities.

2.3.1 Dewatering Operations

The Pipeline mine dewatering operations, as outlined in the Pipeline FEIS, and as approved by the BLM, pump ground water at a maximum annual average rate of 30,000 gallons per minute (gpm); however, this rate could be significantly reduced in the later years of dewatering (BLM 1996a; page 2-12). The hydrologic modeling used in the Pipeline FEIS for the impacts analysis used dewatering rates that were substantially greater than the 30,000 gpm planned for the Pipeline project operations (WMC 1992a and BLM 1996a; page 4-100). Actual pumping rates are less than 30,000 gpm. Subsequent to the approval and construction of the Pipeline project, two years of actual dewatering, and mining operations have shown that substantially less dewatering capacity is needed to mine the Pipeline ore deposit. As a result CGM has conducted additional hydrologic modeling that incorporates the data developed during the two years of dewatering (Geomega 1998a). Based on this recent modeling, CGM has developed a revised dewatering schedule presented in Table 2.3.1.

The water from the dewatering operations is pumped from wells located peripheral to and within the Pipeline open pit (Figure 2.2.1). The ground water production wells each produce up to 3,000 gpm. Pumped ground water is conveyed from the pumping wells through

Table 2.1.1: Summary of Plans of Operations and Environmental Analysis Documents for Cortez Gold Mines 1981-Present

Plan date	Plan Case File No. General Location BLM Administration	Description of Operation	Prop. Acres	Environ. Assessment No./ROD	Plan Approval Date	Comments and Remarks
3-30-81	N64-81-001P Cortez Mine/Cortez Canyon BLM-Battle Mtn	East pit, Horse Canyon pit, waste dumps, heap leach pad, leach ponds, mill, tailings disposal, lab, shop, 17 mile haul road + other ancillary facilities.	1857	N64-EA1-47 by Neal Brecheisen, BLM Geologist	8-11-1981 Letter of Authorization on post 1981 disturbance.	Existing operation when 3809 regulations became effective. Cortez submitted a plan of operation as required by regulations.
5-10-84	N64-81-001P Amendment #1 Cortez Mine/Cortez Canyon BLM-Battle Mtn	Construction of additional tailings cell/pond and surrounding access roads, monitoring wells.	105	Undocumented	10-22-86	Phone conversation records in case file indicate Area Manager verbal approval 10-22-86
5-21-86	N66-P06-01	Cortez Roasting Project; Gold Acres Deposit	264	N66-EA6-29	7-31-86	Approval of POO-FONSI Affected Environment-1.5 pgs.; Mitigation-2 pgs
8-86	N14-81-001P Horse Canyon/Mount Tenabo BLM-Elko	South Extension pit, South Silicified pit, waste dumps.	55.8	Undocumented	10-16-86 Letter of Authorization	
2-26-87	N66-P06-01	Request that existing haul road and water line be included in Plan				
3-19-87	N14-81-001P Amendment #1 Horse Canyon/Mt Tenabo BLM-Elko	Access and drill road construction and drilling.	5			
8-12-87	N64-87-010P Cortez Canyon/Pixie area BLM-Battle Mtn	Construction and drilling.	10	N64-EA7-46 by Ahmed Mohsen, BLM Geologist	10-26-87 Letter of Authorization	Exploration activities were conducted under Notices up to that point. An exploration Plan was required for Cortez' exploration and assessment work on unpatented mining claims.

Plan date	Plan Case File No. General Location BLM Administration	Description of Operation	Prop. Acres	Environ. Assessment No./ROD	Plan Approval Date	Comments and Remarks
8-17-87	N64-87-010P Amendment #1 Gold Acres area/N. Shoshone BLM-Battle Mtn	Exploration: Access and drill road construction and drilling	5	N64-EA7-57 by Ahmed Mohsen, BLM Geologist	9-28-87 Letter of Authorization	Additional exploration activities on claims held by Cortez.
11-9-87	N64-87-010P Amendment #2 Gold Acres area/N. Shoshone BLM-Battle Mtn	Exploration: Access and drill road construction and drilling	1	N64-EA8-13 by Ahmed Mohsen, BLM Geologist	12-3-87 Letter of Authorization	Additional exploration activities on claims held by Cortez.
11-10-87	N64-87-010P Amendment 88-1A	Exploration for 5 additional drill holes		N66-EA7-57	11-18-87 Verbal Approval	
11-19-87	N64-87-010P Amendment #3 Cortez Canyon area BLM-Battle Mtn	Exploration: Access and drill road construction and drilling	1	N64-EA8-16 by Ahmed Mohsen, BLM Geologist	12-14-87 Letter of Authorization	
5-10-88	N14-81-001P Horse Canyon/Mt Tenabo Amendment #1 BLM-Elko	Exploration: Access and drill road construction and drilling	1	Undocumented		Additional exploration activities on claims held by Cortez
5-17-88	N64-87-010P Amendment #4 Cortez Canyon area BLM-Battle Mtn	Exploration: Access and drill road construction and drilling	1	N64-EA8-65 by Ahmed Mohsen, BLM Geologist	6-13-88 Letter of Authorization.	Additional exploration activities on claims held by Cortez
6-13-88	N64-87-010P Amendment #5 Cortez Canyon area BLM-Battle Mtn	Exploration: Access and drill road construction and drilling	1	N64-EA8-83 by Ahmed Mohsen, BLM Geologist	8-16-88 Letter of Authorization	Additional exploration
6-29-88	N14-81-001P Amendment #2 Four Mile area/Mt Tenabo BLM-Elko	Exploration: Access and drill road construction and drilling	1.32	Undocumented	Letter of Approval	
7-12-88	N14-81-001P Amendment #3 Upper Mill Cy/Mt Tenabo BLM-Elko	Exploration: Access and drill road construction and drilling	1	Undocumented	8-2-88 Letter of Approval	

Plan date	Plan Case File No. General Location BLM Administration	Description of Operation	Prop. Acres	Environ. Assessment No./ROD	Plan Approval Date	Comments and Remarks
7-88(?)	None in file. Amendment to POO N66-87-001P	Access and drill road construction and drilling	?	N66-EA8-83	8-88	Approval of Plans - FONSI (8-15-88). Refers to N66-EA7-46.
7-18-88	N64-87-010P Amendment #6 Cortez Canyon/Pixie area BLM-Battle mtn	Access and drill road construction and drilling	12	N64-EA8-91 by Ahmed Mohsen, BLM Geologist	10-3-88 Letter of Authorization	
10-6-88	N64-86-001P Amendment # 2 Gold Acres Mine/N. Shoshone BLM-Battle Mtn	Expansion of waste dumps and processing of old leached ore piles.	?	N64-EA9-11 by Ahmed Mohsen, BLM Geologist	11-25-88 Letter of Authorization	Extension of waste dumps and remaining of old ore stockpiles
11-29-88	N64-87-010P Amendment #8 Cortez Canyon area BLM-Battle Mtn	Access and drill road construction and drilling	10	N64-EA9-25 by Ahmed Mohsen, BLM Geologist	3-14-89 Record of Decision	A 1500-acre exploration target under Cortez' control was identified. Programmatic EA to cover exploration activities as submitted by Cortez and approved by BLM.
1-23-89	N64-81-001P Amendment #2 Cortez Mine/Cortez Canyon BLM-Battle Mtn	Development of the ADA 52 deposit and pit and waste dump expansion.	75	N64-EA9-34 by Ahmed Mohsen, BLM Geologist		
3-2-89	N64-81-001P	Application for removal of 3,000 cu yds gravel				
4-19-89	N64-87-010P Amendment #7 Cortez Canyon/Pixie area BLM-Battle Mtn	Access and drill road construction and drilling.	5	N64-EA8-91 by Ahmed Mohsen, BLM Geologist	5-2-89 Letter of Authorization	Previous plan proposed 12 acres; only 7 were conducted. Cortez shifted remaining acreage to an adjacent location that is of similar affected environment.
4-27-89	N64-81-001P Amendment #3 Cortez Mine area F-Canyon project BLM-Battle Mtn	Mining F-Canyon pit and waste dumps.	60	N64-EA0-17 by Ahmed Mohsen, BLM Geologist	2-8-90 Letter of Authorization	Development of the F-Canyon pit to increase amount of oxide ore to mill until roaster comes on line.

Plan date	Plan Case File No. General Location BLM Administration	Description of Operation	Prop. Acres	Environ. Assessment No./ROD	Plan Approval Date	Comments and Remarks
12-89	N64-EA0-17	Amendment to Cortez Mine POO N64-81-001P	?		Approved 2-7-90	ADA-52 deposit & F-Canyon Project
1-90	N64-87-1010P Amendment #10 Cortez and Gold Acres area -BLM-Battle Mtn	Expansion - tailings, heap leach, open pit expansion	428	N64-EIS3-54	9-20-93 Record of Decision	EIS required by BLM for Expansion activities.
2-90	POO Horse Canyon, Cortez Canyon, Gold Acres BLM-Battle Mtn				2-8-90	
3-20-90	POO Supplement BLM-Battle Mtn		7			
5-3-90	N64-87-010P Amendment #9 Cortez Canyon+Gold Acres area BLM-Battle Mtn	Access and drill road construction and drilling	5	Tiering on existing EA for the project area	9-17-90 Record of Decision	Administratively determined to be within the scope of previously prepared EAs for the project area.
2-28-91	N64-81-001P	Proposal to expand gravel pit			5-5-91	
10-7-91	N64-87-010P Gold Acres BLM-Battle Mtn	Exploration Drilling	6.5	N64-EA2-13	1-28-92	
2-28-92	N64-87-010P Gold Acres BLM-Battle Mtn	Phase I Drilling	2.5	N64-EA2-13	3-12-92	
4-20-92	N64-81-001P Amendment #92-1A BLM-Battle Mtn	Construction of 3 wells for ground water remediation purposes	0.6	N63-CX92-46	5-18-92	
7-13-92	N64-87-010P Amendment #92-3A BLM-Battle Mtn	Construction of 2 water wells and 9 exploration holes		N64-EA2-13	7-28-92	
10-5-92	N64-93-001P Pipeline Project BLM-Battle Mtn	New Open Pit Mine, Dewatering System, Waste Dumps and 5,000 tpd ore processing facility	1,827	NV64-EIS-94-65	3-4-96	
1-28-93	N64-87-010P Amendment #92-2A BLM-Battle Mtn	Exploration Drilling	6.3	N64-EA8-91 N64-EA7-57	2-16-93	

Plan date	Plan Case File No. General Location BLM Administration	Description of Operation	Prop. Acres	Environ. Assessment No./ROD	Plan Approval Date	Comments and Remarks
3-24-93	N64-87-010P Amendment #92-2B BLM-Battle Mtn	Exploration Drilling	16.4		4-29-93	
4-16-93	N64-87-010P Amendment #93-3A BLM-Battle Mtn	Exploration Drilling	7.5	N64-AD3-40	5-14-93	
4-16-93	N64-87-010P Amendment #93-4A BLM-Battle Mtn	Construction of a temporary Fuel Depot	0.5	N64-CX3-36	5-14-93	
6-24-93	N64-87-010P Amendment #93-5A BLM-Battle Mtn	Relocating the explosives facility	1.7	NV64-95AD-05	9-22-93	
7-2-93	N64-87-010P Amendment #92-3A BLM-Battle Mtn	Well drilling to test ground water system			7-28-93	
10-22-93	N64-94-001P Crescent Pit BLM-Battle Mtn.	Development of Crescent Pit	219	N64-EA94-1	5-4-94	
2-3-94	N64-94-001P	Environmental Assessment of Crescent Mine		N64-EA94-21	4-6-94	Decision Record and FONSI.
3-9-94	N64-81-001P Amendment #94-1A BLM-Battle Mtn	Closure of a landfill and opening 2 landfills	0.75	NV64-EA94-082	8-22-94	
7-22-94	N64-81-001P Amendment #94-2A BLM-Battle Mtn	Construction of Monitoring Wells	0.2	NV64-CX94-83	8-23-94	
9-23-94	N64-87-010P Amendment #94-1A BLM-Battle Mtn	Relocation of an explosive facility	1.7	NV64-95-AD-05	11-18-94	
6-29-95	N64-87-010P Amendment #95-1A BLM-Battle Mtn	Construction of 3 drill holes, sumps, and roads	0.8	N64-AD95-061	7-20-95	
10-13-95	N64-87-010P Amendment #96-1A BLM-Battle Mtn	Construction of Exploration Holes for a Gravel Pit	0.5	NV64-CX95-006	1-23-96	
1-8-96	N64-81-001P Amendment #96-1A BLM-Battle Mtn	Construction of 3 Monitoring Wells (ARD)	0.5	NV64-CX96-27	6-21-96	

Plan date	Plan Case File No. General Location BLM Administration	Description of Operation	Prop. Acres	Environ. Assessment No./ROD	Plan Approval Date	Comments and Remarks
2-8-96	N64-87-010P Amendment #96-3A BLM-Battle Mtn	Construction of Gravel Pit	2.5	NV64-AD96-31	3-7-96	
3-25-96	N64-87-010P Amendment #96-4A BLM-Battle Mtn	Construction of a Gravel Pit	75	NV64-EA96-35	5-23-96	
5-13-96	N64-81-001P Amendment #96-2A BLM-Battle Mtn	Construction of 3 Exploration Drill Holes	0.48	NV64-AD96-56	8-28-96	
7-5-96	N64-81-001P Amendment #96A BLM-Battle Mtn	Horse Canyon Exploration		N64-AD96-56	8-28-96	
9-4-96	N64-93-001P Amendment #96-1A Pipeline Project BLM-Battle Mtn	Exploration Activities	50	NV062-AD97-11	2-6-97	
9-16-96	N64-96-001P	Proposal of South Pipeline Project				
3-3-97	N64-93-001P Amendment #97-1A Pipeline Project BLM-Battle Mtn	Relocation of a Road	6.8	NV063-AD97-32	3-5-97	
4-3-97	N64-94-001P Amendment 97-1A	Deepen Crescent Pit by 10'		NV063-AD93-43	4-15-97	
3-27-97	N64-87-010P Amendment #97-1A Pipeline Project BLM-Battle Mtn	Expansion of Project Boundaries	0	NV63-AD97-048	6-4-97	
3-27-97	N64-93-001P Amendment #97-2A Pipeline Project BLM-Battle Mtn	Expansion of Exploration Area	0	NV063-AD97-72	8-18-97	
4-3-97	N64-94-001P Amendment #97-1A Crescent Pit BLM-Battle Mtn	Deepen the Crescent Pit	0	N63-AD97-43	4-15-97	
6-5-97	N64-93-001P Amendment #97-3A Pipeline Project BLM-Battle Mtn	Construction of 70 Infiltration basins	236	NV063-AD94-064	6-17-97	

Plan date	Plan Case File No. General Location BLM Administration	Description of Operation	Prop. Acres	Environ. Assessment No./ROD	Plan Approval Date	Comments and Remarks
10-22-98	N64-93-001P Amendment #981A Pipeline Project BLM-Battle Mtn	Expansion of Infiltration Facilities	600	NV063-EA98-06	3-12-99	

Table 2.1.2: Summary of Approved Surface Disturbance

Mine Facility Component		Approved Disturbed (acres)
MINE AND PROCESS AREA		
Pits	Crescent Open Pit[a]	40
	Pipeline Pit/Haul Roads	276
	Subtotal:	**316**
Ore and Process Facilities	Pipeline Plant Site	56
	Ore Stockpile	19
	Pipeline Tailings/Heap Leach	444
	Pipeline Tailings/Heap Leach	49
	Subtotal:	**568**
Waste Rock Dumps	Crescent Waste Rock Dump[b]	50
	Pipeline Waste Rock Dump	667
	Subtotal:	**717**
Support Facilities	Soil Stockpiles	18
	Plant Area Roads	31
	Gravel Pit	100
	Total Other Area Acreage	362
	County Road Construction	29
	Drainage Diversions	21
	Subtotal:	**561**
	Total Mine and Process Area Acreage:	**2,162**
OTHER AREAS OF DISTURBANCE WITHIN THE PROJECT AREA		
Exploration Activities		48
Mine Water Infiltration Basins/Pipe Lines/Ditches		956
	Total Other Area Acreage:	**1,004**
	TOTAL PROJECT AREA ACREAGE:	**3,166**

[a] Approved disturbance is 54 acres; the additional 14 acres included under Ancillary Facilities.
[b] Approved disturbance is 114 acres; the additional 64 acres included under Ancillary Facilities.

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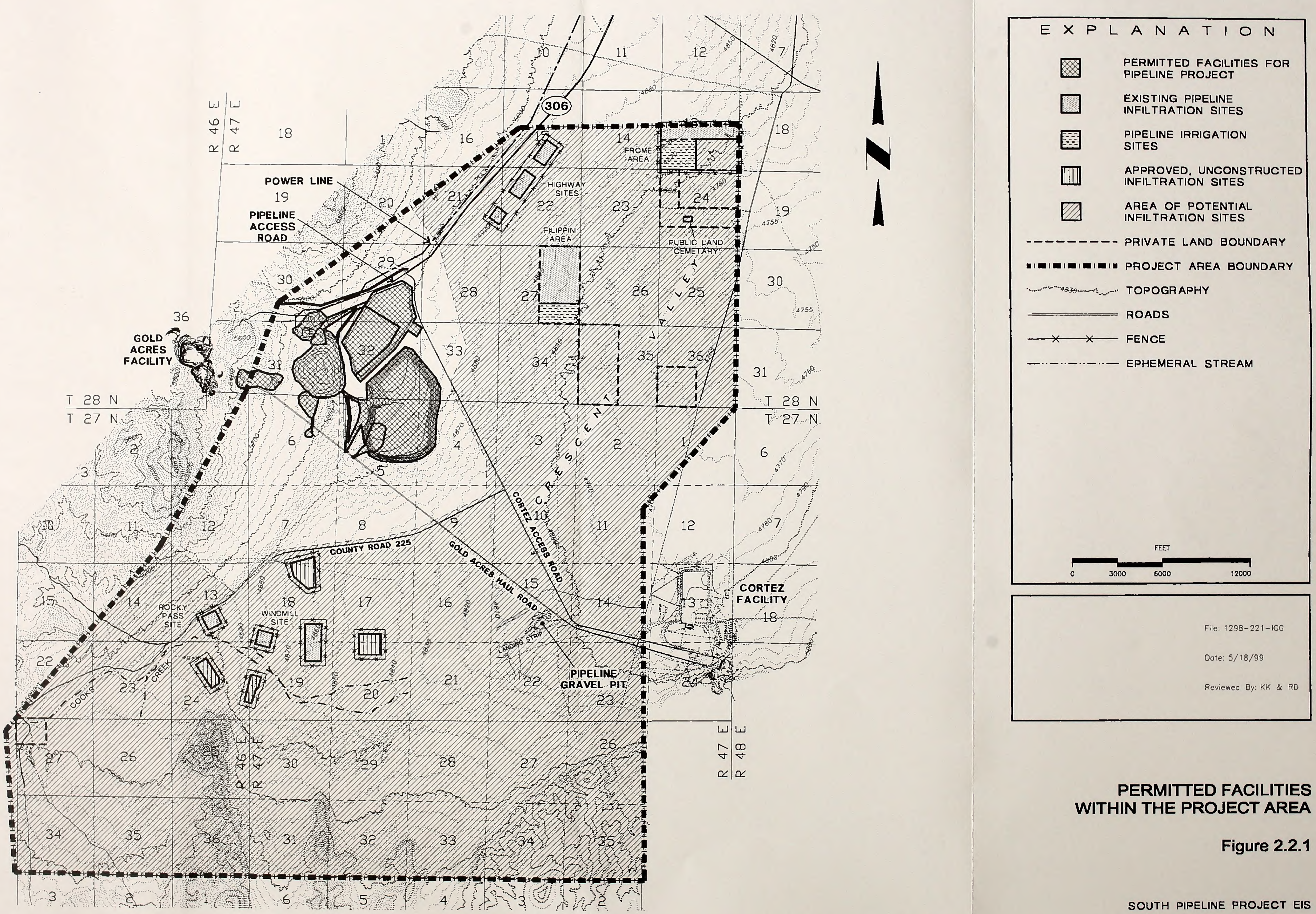

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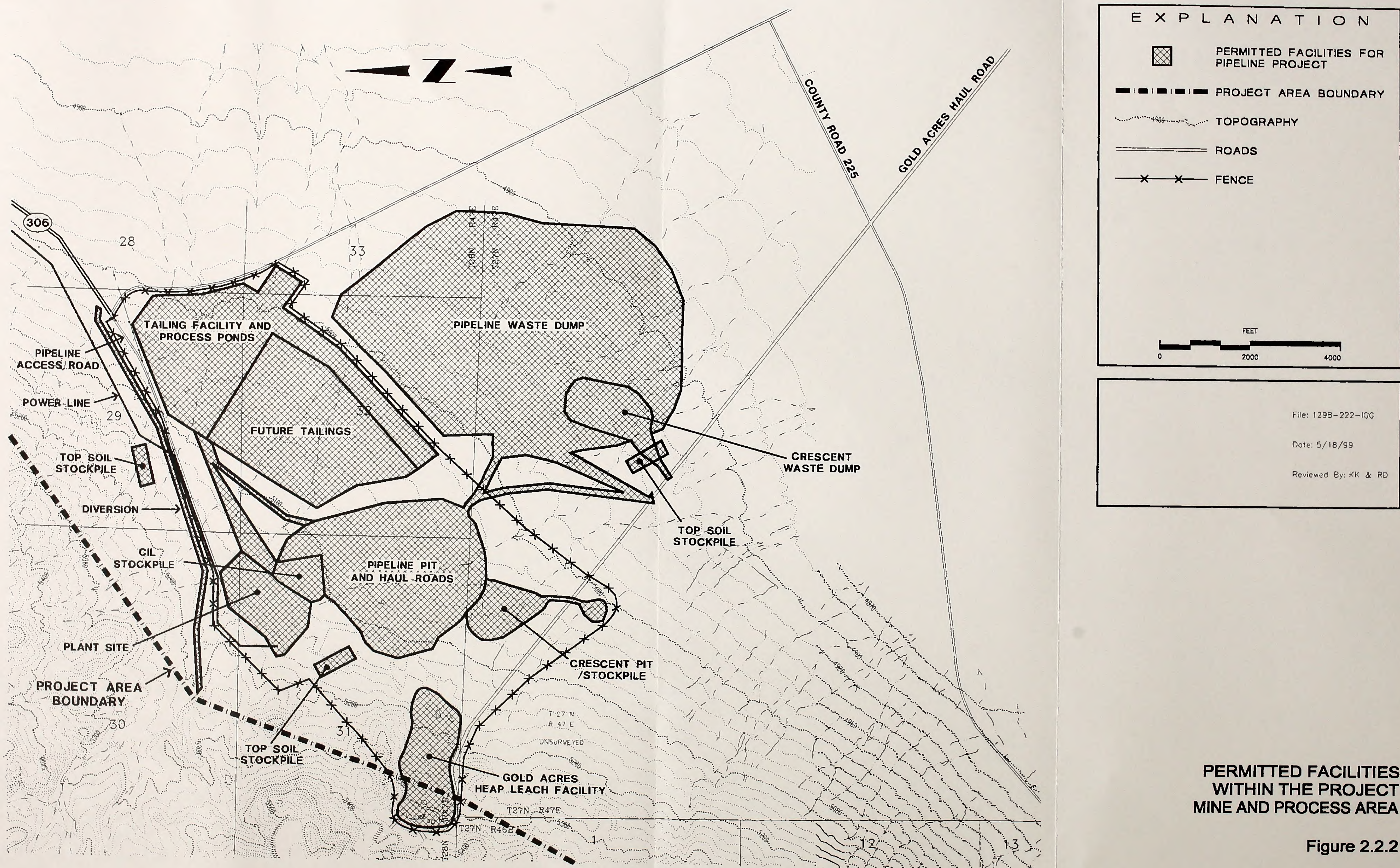
Date: 5/18/99

Reviewed By: KK & RD

PERMITTED FACILITIES WITHIN THE PROJECT AREA

Figure 2.2.1

SOUTH PIPELINE PROJECT EIS



PERMITTED FACILITIES WITHIN THE PROJECT MINE AND PROCESS AREA

Figure 2.2.2

Table 2.3.1: Modeled Dewatering and Infiltration Rates for the Mining of the Pipeline Ore Deposit

Time Year	Dewatering (gpm)	Infiltration (gpm)
0	4,100	2,100
1	15,850	13,850
2	25,150	23,150
3	16,800	14,800
4	15,900	13,900
5	21,300	19,300
6	17,700	15,700
7	21,000	19,000

large-diameter pipelines to water handling operations located at a minimum distance of 2 miles from the center of the Pipeline open pit. The water is then returned through the handling operations to the same ground water basin (State of Nevada Ground Water Basin No. 54 - Crescent Valley).

Mine dewatering provides water of adequate quality for the mining, milling, and non-potable water service needs for the approved Pipeline and Crescent projects. Since only a small portion of the dewatering production is necessary for mine operations, most of the water is piped to the water disposal operations.

2.3.2 Water Disposal Operations

Under the Pipeline Project, CGM conducts dewatering operations at a sufficient capacity to allow for the mining of the Pipeline ore deposit. The approved mine and infiltration operations are shown on Figure 2.2.1.

Infiltration operations consist of the following components which are defined as:

Infiltration facilities - All disturbance and components associated with the infiltration operations including conveyance corridors, and infiltration sites;

Conveyance corridors - Access roads associated with infiltration facilities and pipelines and ditches for water;

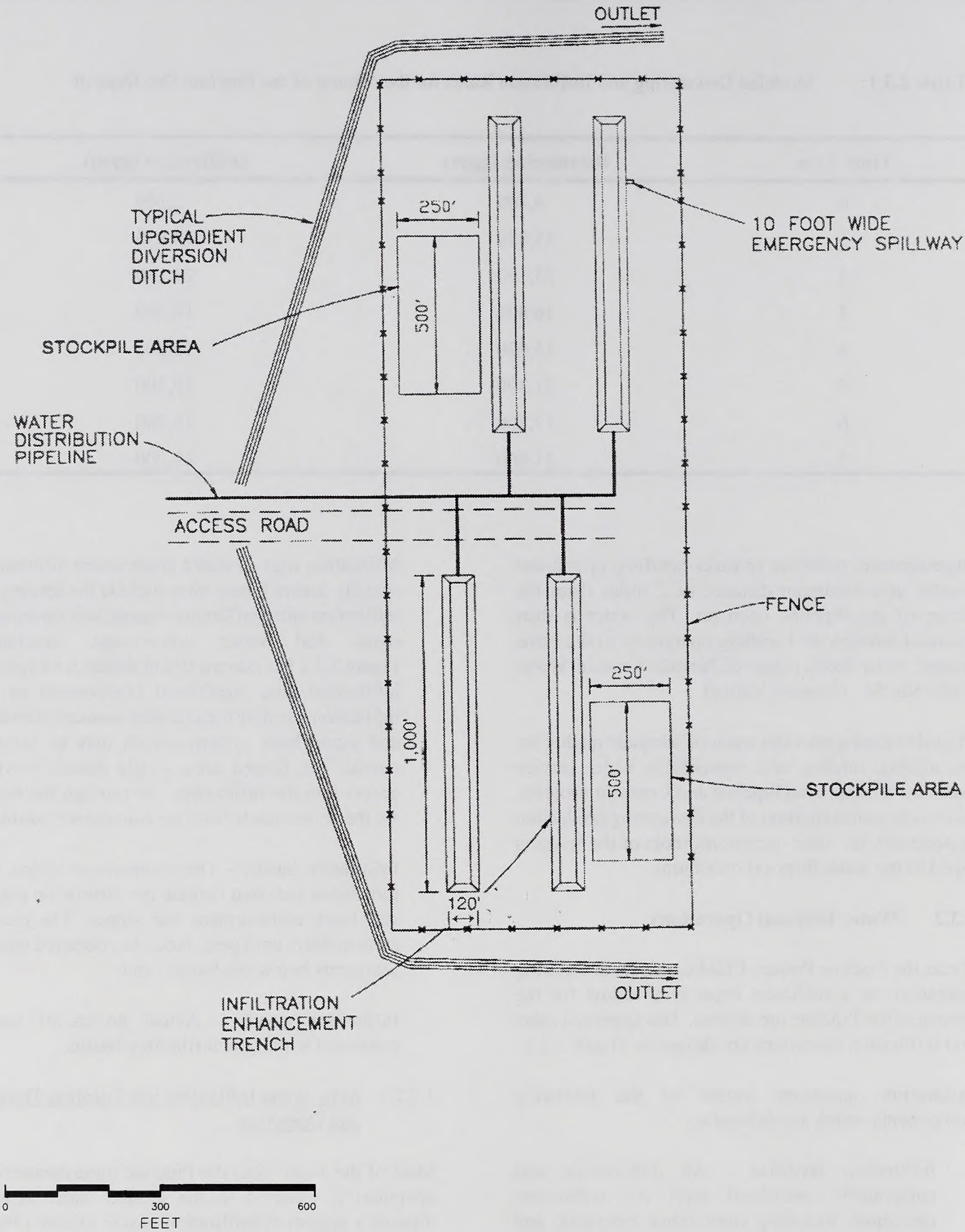
Infiltration sites - Fenced areas where infiltration actually occurs. These sites include the fencing of infiltration sites, infiltration basins, soil stockpiles, roads and water conveyance structures. Figure 2.3.1 is a current layout design for a typical infiltration site. Additional components to an infiltration site may include seep intercept trenches and pump back system, which may be located outside the fenced area. Cattle guards provide access into the infiltration site through the fence for the access roads from the conveyance corridor;

Infiltration basins - The components within the infiltration sites that contain the infiltration ponds and basin embankment and slopes. The basins contain water until percolation has occurred within sediments below the basins; and

Infiltration ponds - Actual bodies of water contained within the infiltration basins.

2.3.2.1 Mine Water Infiltration Site Location, Design, and Operation

Most of the water from the Pipeline mine dewatering operation is returned to the ground water aquifer through a system of infiltration basins. (BLM 1996a; pages 2-13 through 2-18; BLM 1999, pages 2-12 through 2-13). A management plan that outlines the current operational management of the infiltration facilities is part of the Pipeline project infiltration EA (BLM 1999, Appendix A). Infiltration is designed to occur within the Project Area approximately 2 miles



EXPLANATION

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TYPICAL INFILTRATION BASIN DESIGN

Figure 2.3.1

or more from the center of the Pipeline open pit. The Pipeline project infiltration EA identified 13 specific areas as potential infiltration sites (BLM 1999): Highway (public land); Rocky Pass I and II (public land); Airport (public land); Frome (private land); the five eastern sites (public land); and Windmill I and II (public land) (Figure 2.2.1).

Since operations commenced at the Pipeline project, and as discussed in the Pipeline FEIS (BLM 1996a; page 2-15), CGM has modified the location and design of the infiltration basins and associated roads and conveyances (infiltration sites) (BLM 1999). Figure 2.2.1 illustrates the location of the current infiltration sites as of February, 1999. Additional infiltration areas can be located within the Project Area approximately 2 miles or more from the center of the Pipeline open pit.

Once the Pipeline project commenced operation and infiltration began at the Highway Infiltration Site it became evident that the planned and approved infiltration allowed minimal flexibility for the management of infiltration. This has resulted in periods during which dewatering could not keep pace with the mining operations. Thus, water entered the pit bottom and caused periodic cessation of ore mining. Infiltration difficulties occurred for the following reasons: (a) due to the location of non-Cortez Gold Mine (CGM) controlled mining claims, the actual area available within the original 1-mile wide arcuate area for infiltration was very limited; (b) 120 acres has proved to be insufficient to properly manage the infiltration operations to allow some sites to be under active infiltration, others to be periodically idle and awaiting future infiltration, and still others to have been reclaimed and awaiting bond release by the BLM so that approved acreage disturbance could be utilized at other locations; and (c) the underlying geologic formations within the areas available for infiltration were poor media (too fine-grained) for efficient infiltration.

In an effort to address inefficient infiltration, and as projected in the Pipeline FEIS (BLM 1996a; page 2-15), CGM commenced additional infiltration operations on private lands, the Filippini and Frome Infiltration Sites, within the Pipeline project area. This added an additional 236 acres to the infiltration operations. However, these private lands contained underlying geologic formations that were also poor media for efficient infiltration. CGM also reclaimed a portion of the Filippini Infiltration Site and constructed other infiltration sites within the original 1-mile wide arcuate area; Rocky Pass and Windmill Infiltration Sites. These actions were successful in increasing infiltration efficiencies but have been limited in nature. There were additional periods during which water entered the bottom of the Pipeline open pit. In addition, seeps formed down surface gradient from the infiltration basins. One of the seeps reached 17 acres in size and required management by CGM in accordance with Nevada Division of Environmental Protection (NDEP) requirements.

Total surface disturbance permitted by the BLM for infiltration facilities is 956 acres. The amount of infiltration pond surface area fluctuates, depending on the infiltration rate of individual infiltration sites and basins, and ranges from 90 to 200 acres. The assumed average infiltration rate is 1.5 feet/day. However, infiltration efficiency of individual sites varies greatly (from 0.7 feet/day to 2.8 feet/day) (CGM 1997). Evaporative water loss from the infiltration ponds is between 180 and 400 gpm, based on an evapotranspiration rate of 0.5 feet per year (Zones 1961; Plume 1995). Net evaporation is 3.23 feet, times water surface area of 90 to 200 acres is equal to 291 to 646 acre-feet per year of evaporative loss (180 to 400 gpm).

In the event that seepage develops downgradient of an infiltration site, experience indicates that the seeps are generally confined to small drainages and low-lying areas and to date have not exceeded 17 acres in size. Evaporation from these seepage areas is less than open pond surfaces due to partial protection from wind and direct sunlight due to brush and grass along the drainages. It is reasonable that less than 40 gpm of water is lost due to evaporation from seepage areas and the associated collection and pump back systems.

Water is conveyed from the dewatering wells through high-density polyethylene (HDPE) plastic pipe to the infiltration sites. Individual infiltration sites are constructed of up to 25 separate infiltration basins that vary in size up to 1000 feet in length by 120 feet in width, and are excavated down to 15 feet below the natural ground elevation. Locally, a portion of the excavated material is utilized for basin storage embankments so that the total depth of water in each basin may exceed the depth of subgrade excavation. In some of the basins, a series of vertical trenches up to 10 feet in width, 500 feet in length, and 15 feet in depth below the bottom of the basin have been excavated and backfilled with large-diameter screened rock. The trenches, known as French drains, enhance the infiltration capacity of the basins. In addition, holes are drilled between some basins to further facilitate vertical

infiltration. Figure 2.3.1 illustrates the typical design of an infiltration basin.

Flow rates to infiltration sites and individual basins within infiltration sites can be regulated. Regulation is accomplished through selective use of pumps and a complex manifold/valve distribution system that feeds the large-diameter pipelines to the infiltration sites. The amount of water delivered to individual infiltration basins at each site can also be regulated through distribution pipes and valves, or flumes and headgates.

The infiltration basins are generally operated in series such that one basin receives the water, fills, then overflows into an adjacent basin. The water distribution system is operated in a manner that allows individual infiltration basins or groups of infiltration basins to be drained by infiltration and dried so that maintenance work can be performed. Maintenance consists of ripping or scarifying the bottom of a basin to enhance infiltration and/or cleaning finer sediments out that may have accumulated during operation. Entire infiltration sites, consisting of multiple infiltration basins, are occasionally taken "off line" and drained through infiltration for maintenance purposes or for rotating the use of the sites.

2.3.2.2 Mine Dewatering Monitoring

Hydrologic monitoring is conducted by CGM to measure the effects of dewatering and infiltration operations locally in the Pipeline project area and in the southern Crescent Valley region. The monitoring provides feedback to the CGM dewatering and environmental staff for refining and optimizing dewatering operations, and fulfills regulatory requirements of the BLM, the NDWR, and the NDEP. The monitoring requirements are described in the Integrated Monitoring Plan (WMC 1995b) that was prepared as part of the Pipeline FEIS.

The purposes of the monitoring that is performed as a part of the Pipeline Integrated Monitoring Plan include the following: (a) to provide information on flow rates and transient water levels to optimize and manage the Pipeline open pit dewatering operations, (b) to provide an adequate database of water quality information to identify potential changes in water quality in the area, and (c) to provide a triggering mechanism for CGM, if necessary, to mitigate dewatering related impacts on water supply wells and springs/seeps in the affected area.

Monitoring of the mine dewatering system includes the following water quantity and water quality parameters:

- Quantity of water pumped from individual dewatering wells and quantity diverted to each infiltration area;
- Quality of water pumped from individual dewatering wells and composite discharge diverted to infiltration areas;
- Water elevations are monitored monthly at alluvial and bedrock monitoring wells located in the Gold Acres Window, Cortez Window, West Pipeline, and Rocky Pass areas to evaluate the extent of drawdown;
- Process area monitoring wells are sampled quarterly for water quality and water elevation to detect potential leaks or discharges;
- A series of monitoring wells located upgradient and downgradient of each infiltration area are sampled quarterly for water quality and water elevations are measured monthly to detect changes in water quality or ground water elevation;
- Ground water elevation is measured semi-annually at regional wells located within Crescent Valley to evaluate the extent of drawdown;
- Monitoring of flows and field water quality parameters at 24 Seep/Spring locations quarterly and monitoring at seven seep/spring locations semi-annually; and
- Additional surveillance is conducted to observe ground water mounding and seepage from infiltration impoundments that may indicate a need for system maintenance or operational modifications.

Reporting on the various monitoring activities includes reports to three agencies with some of the reported data appearing in more than one report. The BLM receives Quarterly Integrated Monitoring Plan reports within ten weeks of the end of each quarter. The NDWR is provided with pumpage and consumptive use reports, including evaporation estimates from the infiltration operation. The NDWR report is submitted monthly with an annual summary. The NDEP receives quarterly reports as required by Water Pollution Control Permit NEV95111.

In addition, each infiltration site has a series of peripheral water quality monitoring wells. The wells are located both upgradient and downgradient of

individual sites. Monthly and quarterly water samples are taken and analyzed to determine if the operation of infiltration sites results in a change in water quality or ground water elevation. The number of wells, their depth, and the sampling scheme for each infiltration facility are discussed in the Management Procedures for the Pipeline Project Infiltration Operations (BLM 1999; Appendix A).

Monitoring as part of the dewatering system includes the following quarterly water quality and water quantity parameters:

- Quality of water produced from dewatering wells;
- Composite quality of mine dewatering water at the point of discharge;
- Hydrochemical characteristics of ground water in monitoring wells and the wells that show a water-level change of more than 10 feet in response to infiltration;
- Water elevations in the existing dewatering wells, monitoring wells, and 21 regional alluvial ground water monitoring points; and
- Water elevations in all wells on the valley floor within 5 to 7 miles of the Pipeline open pit.

2.3.3 Watering Troughs for Livestock

Cattle grazing in the area of the infiltration sites are attracted to the water and have trampled down fences or attempted to cross cattle guards to access water in the infiltration basins. As a result cattle are in danger when attempting to access water and in some instances have had to be disposed of when they become entangled in a cattle guard.

In an effort to address this issue, CGM, with BLM approval, is installing up to ten cattle watering troughs adjacent to the infiltration sites and other selected areas within the portion of the Project Area. Troughs will be operated on a rotational basis, in consultation with the grazing permittees and the BLM.

Surface disturbance associated with the watering troughs is included in the approved 936 acres of disturbance for the infiltration facilities. Water is obtained by tapping into the dewatering pipeline at appropriate locations. The taps are a minimum of 1 inch in size and have isolation valves. The valves feed into a heavy-duty rubber hose that carries water to troughs. Float valves are placed on the watering troughs to prevent water from being wasted and to reduce mud areas with associated disturbance. Where possible, troughs are placed on infiltration site-related disturbance outside of fenced areas to minimize trampled vegetation and additional disturbance associated with animal compaction. The period of use of dewatering water for cattle is coordinated with the grazing permittee and the BLM. CGM, and/or the grazing permittee, are assigned stock water rights to the troughs. The troughs are designed with avian exit ramps.

CGM has constructed earthen ramps over the water pipeline portions of the conveyance corridors to aid livestock movement around the water pipelines and through the unfenced portions of the Project Area. CGM consults with the grazing permittees and the BLM on the siting of the earthen ramps.

2.4 Approved Waste Rock Dumps

Approved surface disturbance associated with the Pipeline and Crescent waste rock dumps is approximately 667 and 114 acres, respectively, and have the combined capacity to store approximately 250 million tons of waste rock (BLM 1996a; page 2-52, BLM 1994; page 2-6) (Figure 2.2.2). The Crescent waste rock dump is currently complete and will be incorporated into the Pipeline waste rock dump. The Pipeline waste rock dump is developed by end-dumping waste rock from the mine haul trucks, resulting in a working dump face angle of approximately 38 degrees (the angle of repose). Wherever feasible, the waste rock dumps are designed and built as terraced structures to facilitate recontouring and reclamation. A 30 percent swell factor is assumed in the conceptual facility designs. The height of the waste rock dump will be up to 200 feet above local grade. The Pipeline Waste Rock Dump Study (WMC 1995c) identified a low potential for impacts resulting from the waste rock material, therefore, waste rock dump encapsulation liners are not part of the Pipeline project due to the low acid rock drainage potential of the waste rock.

2.5 Approved Ore Processing Facilities

The approved ore processing facilities that would be utilized by the Proposed Action include the Pipeline mill and tailings facilities, located within the Project Mine and Process Area, and ancillary facilities located within the JVA. Ancillary facilities for processing of ore derived from the South Pipeline open pit include the Cortez CFB roaster, CIL mill, and tailings facility.

2.5.1 Pipeline Mill Facility

The existing Pipeline mill and tailings facility are located within the Pipeline mine and process area. The mill commenced operation at 5,000 tpd and was subsequently increased to 11,000 tpd. Surface disturbance associated with the Pipeline mill and tailings facility totals 500 acres.

2.5.1.1 Pipeline Crushing and Grinding

Ore from the Pipeline open pit is fed from the ore bin to a jaw crusher and then conveyed to a 25,000-ton coarse-ore stockpile, which results in approximately 19 acres of disturbance. The crushed ore is reclaimed from the stockpile and fed, via conveyor, to a semi-autogenous grinding (SAG) mill, which grinds most of the ore to a sand particle size. Oversize material from the SAG mill is discharged and reduced in size by a cone crusher, then recycled back through the SAG mill. The fine fraction from the SAG mill is ground to a finer powder by a ball mill. The final ground product, which has been mixed with water and a weak cyanide solution to form a slurry during grinding, is fed to the CIL circuit.

2.5.1.2 Pipeline Carbon-In-Leach (CIL) Circuit

The slurried ore from the grinding process is piped to a thickener that allows the ground ore to settle while the excess water is decanted from the slurry. After the thickener, the ore slurry is pumped through a series of eight CIL tanks. Gold is dissolved in the weak cyanide solution and adsorbed onto activated carbon (charcoal) granules which are present in the CIL tanks.

2.5.1.3 Pipeline Carbon-In-Column (CIC) Circuit

In addition to the gold deposited onto the carbon granules in the CIL tanks, there is some gold that remains dissolved in the solution overflowing the thickener tank. This solution is run through a series of carbon columns (the "carbon-in-columns") where the gold is removed from the solution and deposited onto carbon granules. Once the gold is removed from the solution in these columns, the barren solution (a solution not containing precious metals) is recirculated through the grinding process.

2.5.1.4 Pipeline Recovery and Refining Circuit

The gold-bearing carbon granules from the CIL and CIC circuits are first sent to the carbon stripping circuit, where gold is removed from the carbon granules. In the stripping circuit, the gold-bearing carbon is placed in a pressurized tank and a hot chemical solution containing sodium cyanide and sodium hydrochloride is circulated through the carbon. The gold is dissolved into this solution, then cooled and circulated through an electrical unit that causes the gold to precipitate onto steel wool. The carbon, now free of gold, is dried and reactivated in a kiln, then reused in the CIL and CIC circuits. The steel wool containing the gold is mixed with fluxes and melted in an electric furnace into buttons containing gold and some impurities. Several buttons are combined in a second melting furnace for initial refinement and then poured into a bar mold. The gold bar is removed from the mold and prepared for shipment off-site to a buyer.

2.5.2 Pipeline Tailings and Heap Leach Facility

The Pipeline tailings facility and heap leach facility comprise a single integrated system (Figure 2.2.2). The Pipeline tailings facility consists of the following: an embankment; a composite liner of compacted soil, a synthetic liner, and a drain blanket; and lined solution collection ditches and ponds. The future tailings portion of the tailings facility has been utilized for additional heap leach pad capacity.

Once gold has been removed from the ground ore, the mill process slurry, consisting of spent ore material, now called "tailings," and water is transported through a pipeline to the tailings facility located east of the mill (Figure 2.2.2). Tailings are deposited around the facility through a series of valved spigots operated to optimize tailings deposition and consolidation. When the slurried tailings are discharged into the tailings facility, the tailings and water separate. The tailings are deposited near the spigots and the water flows to a pond area. The water solution clarifies further as the remaining solids settle to the bottom of the pond. The clarified solution is pumped through a piping system that transports the solution back to the mill for reuse. The tailings are dewatered by an underlying drainage blanket placed on top of a HDPE liner. The drainage blanket aids in the solidification of the tailings for surface reclamation. The drainage blanket discharges solution to lined perimeter collection ditches, which in turn drain into lined solution collection ponds. The approved Pipeline tailings facility covers 444 acres and has sufficient capacity for planned production under the Pipeline project.

The tailings facility embankment will reach a maximum height of 130 feet. The tailings impoundment/heap leach facility composite liner consists of a 24-inch-thick secondary liner of compacted soil having a permeability specification of 1×10^{-6} cm/sec covered

by a 60-mil-thick HDPE geomembrane primary liner. Gravity flow solution collection ditches around the perimeter of the embankment have been similarly lined with an 80-mil-thick HDPE geomembrane primary liner.

The Pipeline tailings facility is being constructed in phases to accommodate tailings material produced over the life of the mining of the Pipeline ore deposit. The facility is surrounded by containment berms, which prevent surface run-on from entering the facility and prevent the escape of process solutions from the facility. The facility has been designed to contain all tailings and solutions in accordance with Nevada Division of Environmental Protection (NDEP) and BLM requirements.

Concentrations of weak acid dissociable (WAD) cyanide in the tailings impoundment are maintained at less than 50 parts per million (ppm), and generally below 20 ppm, for the purpose of protecting wildlife. The low concentrations are achievable because of the low cyanide requirements in the leaching circuit and by washing the tailings with a solution which is much lower in cyanide concentration prior to discharge to the tailings facility. A cyanide detoxification system has been installed in the process facility to be used should it ever become necessary to ensure lower cyanide levels in the tailings discharge.

The Pipeline heap leach facility consists of the same liner system used under the Pipeline tailings facility, The liner system is used for the heap, and a double liner system for the solution ponds and ditches. The Pipeline heap leach facility shares the same liner with the Pipeline tailings facility in order to minimize surface area disturbance and allow effective use of heap leach material for the construction of tailings embankments.

The double-liner system for the solution storage ponds consists of a 60-mil-thick HDPE geomembrane primary liner over a 40-mil-thick geomembrane secondary liner. A geofabric drainage layer between the two liners allows for drainage of any solution which may leak through the primary liner, thus providing hydraulic relief and reducing the potential for solution to migrate through the secondary liner.

The Pipeline heap leach facility is being constructed in phases to accommodate the heap leach material produced over the life of the Pipeline ore deposit. The solution ponds can contain, in addition to the normal operating solution volume, precipitation from a 100-year, 24-hour storm event. The facility is surrounded by containment berms, which prevent surface run-on from entering the facility and prevent the escape of process solutions from the facility. The facility has been designed to contain heap leach solids and solutions in accordance with NDEP and BLM requirements.

2.5.3 Gold Acres Heap Leach Facility

The Gold Acres heap leach facility consists of a heap leach pad and associated solution ponds. The Gold Acres heap leach facility was designed and constructed in two phases to achieve zero discharge of process fluids. The capacity of the facility is approximately 4.6 million tons.

The Phase 1 portion of the pad was lined with a single 60-mil HDPE smooth geomembrane liner material. The downgradient end of the pad was lined with 60-mil HDPE textured geomembrane liner material for stability purposes. The Phase 2 portion of the pad was lined with a single 60-mil HDPE smooth geomembrane liner material. Where solution collection was constructed, a single layer of 80-mil HDPE smooth geomembrane was placed. All liner material was placed on a 1-foot thick prepared native soil material base which serves as the second liner required by NDEP.

Eighteen inches of crushed leach-grade ore material was placed on the liner surface to prevent damage during the placement of the run-of-mine ore. The ore is placed on the pad by end-dumping from haul vehicles in lift heights of 15 feet to a final height of 100 feet. The application rate of the dilute sodium cyanide solution is 0.005 gallons per square foot per minute, with a maximum process rate of 2,000 gpm. Ponding and pooling of process solution on the heaps is prevented by scarifying the area prior to the application of the cyanide solution. After percolating through the heap, the leach solution is collected in pipes under the heaps and routed to the solution collection process ponds.

The two process solution ponds were lined, from the top down, with a single layer of geotextile material, a single layer of 40-mil HDPE smooth geomembrane liner material, a single layer of geonet material, and a single layer 60-mil HDPE smooth geomembrane liner material.

To prevent avian and terrestrial wildlife from entering the process pond area, both solution collection ponds were covered with migratory control HDPE cover balls and surrounded by a 6-foot security fence. All solution collection channels were covered with crushed rock

material to prevent open solution travel. The pad area was also enclosed with a four-strand barbed-wire fence.

The heap leach facility is designed and constructed to be a closed-circuit, zero discharge system in terms of potential leakage and overflow. The process solution ponds can contain the process solutions plus runoff from a 100-year 24-hour storm event with an eight-hour power outage. The pad area is surrounded by HDPE-lined containment berms to prevent surface runoff from entering the facility, and to prevent escape of process solutions. Stormwater diversion channels that can contain flows from a 100-year 24-hour storm event were also constructed around the pad area.

2.5.4 Cortez CFB Roaster, CIL Mill, and Tailings Facility

The Cortez Facilities include the crushing and grinding circuits, the CFB roaster, the CIL mill, and the tailings facility. The majority of the existing Cortez facilities are located on patented land. A general discussion of crushing and grinding, tailings, and CIL mill processes are described above (see Sections 2.5.1 and 2.5.2). A description of the CFB roasting process is provided below.

The CFB roaster raises the temperature of dry, crushed and ground ore to temperatures near 1,300 degrees Fahrenheit (700 degrees Celsius), thus oxidizing carbon- and sulfide-rich ores and freeing the gold for extraction by subsequent CIL mill processing. Exhaust gases from the roaster flow through a gas cleaning plant where dust, sulfur dioxide, mercury, and other impurities are removed prior to atmospheric discharge through a stack.

2.6 <u>Approved Support Activities</u>

2.6.1 Support Facilities

CGM support facilities associated with the Proposed Action are located at the Cortez Facilities and Pipeline project area. Pipeline administrative and support facilities are identified on Figure 2.2.2 and include the following:

- Administration Office
- Safety/Change House, including a First Aid Station
- Mill Facility
- Assay Lab
- Shop/Warehouse/Core Shed/Dewatering Shop
- Gold Acres Facilities
- Bioremediation Facilities
- Landfill Area
- Ready Line
- Heavy Equipment Fuel Station
- Light Vehicle Fuel Station
- Diesel Storage Facility
- Gas Storage Facility
- Miscellaneous Lubricants Storage Facility
- Explosives Storage Magazines and Silos

Existing administrative and support facilities located at the Cortez operations include an administrative office, assay lab, and first aid station, all of which are located in buildings at the Cortez mill area. Other Cortez facilities include the existing mobile mining equipment ready line, maintenance shop, explosives magazine, office, and fuel and lube-oil storage facilities.

Surface disturbance for support facilities within the Project Area associated with the Pipeline project and Crescent Pit totals approximately 362 acres. The approved acreage is located within the support facility area, discussed under Section 3.6.

The areas surrounding the existing facilities, as well as the Project, contain numerous drainage channels that flow only during times of intense precipitation and snow melt. Engineered stormwater diversion structures, which are described in the Pipeline Plan of Operations (CGM 1992; Figure 4, page 5-5), route the stormwater around the constructed facilities. Naturally occurring drainage courses are utilized as much as possible to reroute stormwater runoff. Surface flows are controlled by channeling flow around the facilities in diversion ditches which protect Pipeline project facilities from being inundated by surface runoff. The diversion ditches also prevent contamination of runoff by routing flows away from the mining facilities, a requirement of CGM's stormwater permit.

2.6.2 Work Force

The work force for CGM operations is expected to fluctuate between 450 and 500 employees during the life of the Pipeline project. Of the current 456 employees, 94 employees live in the town of Crescent Valley and Beowawe, 62 live in Battle Mountain, 51 live in Carlin, and 249 employees live in the Elko/Spring Creek area.

2.6.3 Mobile Equipment

The mobile equipment utilized by the Pipeline project are outlined in Table 2.6.1.

Table 2.6.1: Existing Facilities Mobile Equipment List

Type of Equipment	Number of Units[a]
Electric Shovels	2
Front Loaders / Hydraulic Shovels	4
Haul Trucks (85-310 ton)	15
Rotary Drills	5
Track Bulldozers	4
Rubber Tired Bulldozers	1
Motor Graders	2
Water Trucks	2
Loaders	3
Blasting Trucks	3

[a] Number of units reflects current inventory. The number may change from time to time due to pre-strip requirements, ore benches, etc.

2.6.4 Water Supply and Consumptive Use

The permitted consumptive water use for the Pipeline project is 2,000 gpm. The primary consumptive uses of water by the Pipeline project and Crescent Pit are to replace evaporative losses at the tailings and heap leach facilities; for mill processing; and for dust control on the roads. Some water is also consumed as entrained moisture in the mill tailings and heap leach material. These uses total approximately 1,100 gpm. Water is also lost through evaporation from the infiltration basins, which totals up to approximately 500 gpm Approximately 200 gpm is used on private land within the Project Area as part of CGM's reclamation of those areas. Water used for mining and processing associated with the Pipeline and Crescent Pit projects is supplied through the mine dewatering wells (Section 2.3.1). Potable water at the Pipeline project and Cortez Facilities is provided via bottled water or a fresh water supply well.

2.6.5 Power Supply and Utilities

Electrical power to the Pipeline mine and process area is provided by Sierra Pacific Power Company (SPPCo) through a 120 kilovolt (kV) transmission line from the Battle Mountain area. The line connects the Reese River substation in Battle Mountain to the Cortez Tap Switching Station in Whirlwind Valley (approximately 12 miles). It then proceeds 23 miles south to a substation at the Pipeline mill. Mine site communication facilities for the Pipeline project consist of two towers, 60 and 100 feet in height, tracking equipment throughout the Pipeline mine and process area associated with the Modular Mining System, and a mine equipment monitoring and management system in the open pit. Telephone communications consist of fiber optic and microwave facilities between the Cortez Facilities and the Pipeline project, as well as a cellular site at the water tank west of the Pipeline mill. Mine, mill and maintenance communication is maintained via a repeater facility on a 50-foot tower. The serial numbers for communications facility right-of-ways (ROWs) are N-7803, N-30650, and N-2616.

2.6.6 Waste Disposal and Sanitary System

All sanitary waste is disposed of in existing, on-site, state-approved sanitary leach fields. All trash and refuse is hauled to an approved Class III-waivered landfill facility located on private land within the Project Area. All refuse is handled in accordance with applicable federal, state, and county laws and regulations. CGM has initiated a recycling program for cardboard, aluminum, and office paper.

2.6.7 Chemical Storage and Hazardous Materials Management

2.6.7.1 Chemical Storage

Chemicals that are required for the operations within the Project Area are listed in Table 2.6.2. Several of these chemicals, as well as other materials, which are transported, stored, and/or used are designated as hazardous materials or substances (as defined in 49 Code of Federal Regulations (CFR) 172.101 or 40 CFR 302.4 or the Superfund Amendments and Reauthorization Act of 1986 (SARA) Title III). Hazardous materials and substances that are transported, stored, and/or used on site in quantities greater than the Threshold Planning Quantity (TPQ) designated by SARA Title II for emergency planning are also listed in Table 2.6.2.

2.6.7.2 Hazardous Materials Management

Transportation and handling of chemicals is conducted by licensed carriers and properly trained workers. All vehicles and containers carry the appropriate placards. All chemicals are transported to the Pipeline project by licenced commercial carriers on public roadways in accordance with applicable regulations. Routes used to transport chemicals include U.S. Interstate 80 (I-80), State Route (SR) 306, and Lander County Route 225. Chemicals are stored at the existing facilities and protected from the elements. Petroleum fuels are stored in above-ground tanks and surrounded with a containment structure to accommodate at least 110 percent of the volume of the largest tank within the containment area. Most of the storage tanks are double-walled.

Waste oil is either used as heating fuel, recycled offsite, or disposed of by manifesting to an authorized off-site disposal facility. Where possible, solvents are used that can be classified as nonhazardous waste upon disposal. Any wastes that are classified as hazardous are managed in accordance with prevailing federal and state regulations and guidelines.

A Spill Prevention, Control and Countermeasures Plan (SPCCP) has been prepared for the existing CGM facilities consistent with federal regulation 40 CFR 112. The SPCCP has been prepared in accordance with good engineering practices and describes in detail the measures to be taken to prevent the escape of pollutants from containment facilities and to ensure subsequent cleanup as necessary for petroleum products.

A Hazardous Material Spill and Emergency Response Plan has also been prepared for the existing CGM facilities in accordance with State of Nevada regulations governing the design, construction, operation and closure of mining operations (Nevada Administrative Code (NAC) 445A.242 through 445A.243). The plan describes procedures and methods to be implemented for the abatement and cleanup of any pollutant that may escape proper containment at the facility. The existing process systems are designed so that any solution spill drains to a collection area where spillage can return to the system. The total interconnected storage capacity of the solution ponds is adequate to contain storm events and maintain adequate operating freeboard capacity.

2.6.8 Roads and Haul Roads

Many CGM roads and haul roads exist within the JVA. The existing CGM Gold Acres haul road across Crescent Valley has a ROW (N-43670) 120 feet wide to accommodate the haul trucks. Figure 2.2.2 shows the location of these roads and haul roads within the Pipeline project area, and Figure 2.2.1 shows the location of the Gold Acres haul road within the JVA. Lander County Road 225 (N-58510), a 25-foot wide gravel road, traverses the Project Area, as shown on Figure 2.2.1.

SR 306 (N-044669) serves as the principal access road to CGM projects. SR 306 now terminates at the junction with Lander County Route 225, in the vicinity of the Pipeline project mine and process area. Lander County has acquired from the BLM the ROW (N-60542) for that portion of former SR 306 from its junction with County Road 225 to Gold Acres. CGM has agreed to assist Lander County by providing maintenance on County Road 225 during the life of the Pipeline project. After closure of the Pipeline project, maintenance of County Road 225 will revert to Lander County.

CGM uses a dust suppressant to control fugitive dust on the haul roads as needed to supplement the routine application of water from mine water trucks. Magnesium chloride and other dust suppressants have been used in the past, and have proved to be very effective in suppressing dust emissions.

2.6.9 Cortez Gravel Pit

The Cortez Gravel Pit is located along the south side of the Gold Acres haul road, approximately 1 mile west of the Cortez facilities. Gravel material from this pit is used by CGM for road surfacing, concrete, and other

Table 2.6.2: Annual Chemical Use by Existing Pipeline Operations

Substance[a]	Annual Usage [b] (lbs)
Sodium Cyanide	1,559,500
Lime	6,508,600
Hydrochloric Acid	927,500
Sodium Hydroxide	342,800
Flocculant[c]	335,800
Descalent	347,000
Gasoline	650,000
Diesel Fuel	30,500,000
Ferris Sulfate	2,640,000
Ammonium Nitrate	15,600,000

[a] The following hazardous materials may also be transported, stored, and used at the plant site in smaller quantities: acetone; ammonium hydroxide; calcium hypochlorite; ethyl alcohol; freon; isopropyl alcohol; litharge (lead oxide); nitric acid; petroleum solvents; sodium hypochlorite; soda ash; and sulfuric acid. Sodium hypochlorite, hydrogen peroxide, and sulphuric acid are used as neutralizers and are kept on-site for emergencies. Small quantities of hazardous materials not included in this list may be used as laboratory reagents, paints, office products, and maintenance products.

[b] Quantities do not include Cortez CFB roaster, CIL mill and tailings facilities chemical usage.

[c] Flocculants used include Thatchler Polymer T-Floc, A-830, Nalco Nuclear 9708, and DULV Flocculant D8D.

related uses tied to the construction and operation of the Pipeline project and other CGM facilities.

Surface disturbance approved for the Cortez Gravel Pit is approximately 100 acres. Approximately 750,000 cubic yards of gravel may be used during the expected 10-year life of the Pipeline project.

2.6.10 Fencing

To prevent interference with mining and processing operations and to protect the general public, livestock, and wildlife from harm, a 6- to 8-foot high fence has been constructed adjacent to all cyanide solution ponds. The facilities within the Pipeline project mine and process area have been fenced with a four-strand range fence. Appropriate warning signs have been placed on the fence at 200-foot intervals. All access roads to these areas are gated with locking capability to provide vehicular access control. Infiltration sites and open channel corridors are also enclosed and the fences are maintained by CGM. The location of the fencing is shown on Figures 2.2.1 and 2.2.2.

2.6.11 Health and Human Safety

CGM operations are subject to the requirements of the Federal Mine Safety and Health Act of 1977 (MSHAct), which sets forth mandatory safety and health standards for mines. The purpose of these standards is the protection of life, promotion of health and safety, and prevention of accidents. Provisions include warning signs, access control and machine guards that must be in place where required. Cyanide use areas must be well marked, and access strictly controlled and restricted to trained personnel. The regulations promulgated under MSHAct are codified at 30 CFR, Subchapter N, Part 56.

Sampling and testing equipment is available onsite to monitor personnel for exposure to hazardous or toxic emissions characteristic of specific work areas, such as assay labs or the refinery. Employees assigned to work areas of potential exposure to hazardous or toxic emissions are subject to blood and urine tests on a quarterly basis or more frequently when necessary. For routine and unplanned maintenance, individual vessel entry procedures are established to assure safe access and working conditions.

2.6.11.1 Security

Security in the JVA is the responsibility of CGM. A roving security patrol provides access control for the entire site during the operational phases of the Project. The security system includes direct security measures, supported by employees involved in the day-to-day operations.

2.6.11.2 Fire Protection

Adequate fire prevention equipment and a fire protection plan are established and in place for all of CGM's operations. These procedures comply with all regulations imposed by the Mine Safety and Health Administration (MSHA) and applicable state and county fire codes and regulations.

2.7 Exploration

CGM is conducting mineral exploration and condemnation activities within the Pipeline project area as part of the Pipeline project. Surface disturbance associated with these activities conducted under the Pipeline project and outside of the identified areas of disturbance, but within the Pipeline project area, totals 48 acres.

2.8 Reclamation

As presented in the Pipeline project FEIS and Pipeline Infiltration Project EA, CGM has identified the reclamation activities to be undertaken as part of the Pipeline project (BLM 1996a; pages 2-27 through 2-35; BLM 1999; pages 2-11 and 2-14). The activities include the following:

- Prevention of slope instability;
- Control of soil erosion and sediment transport;
- Reduction in visual impacts;
- Restoration of surface hydrology patterns;
- Revegetation of disturbed sites; and
- Establishment of diverse perennial vegetation communities.

2.9 CGM Environmental Protection Measures

As identified in the Pipeline project FEIS, CGM has committed to the following activities in order to minimize environmental effects associated with the Pipeline project (BLM 1996a; pages 2-35 through 2-40). These commitments include:

- Control of fugitive dust from roads and disturbed surfaces;
- Sediment control;
- Conformance with the spill prevention and containment plan;
- Human health, safety, and emergency response training;
- SARA Title III reporting;
- Monitoring; and
- Long-term financial assurance.

In addition, a noxious weed monitoring and control plan (JBR Environmental Consultants, Inc. 1998b) was incorporated into the Pipeline project plan of operations with the purpose of taking a proactive approach to weed control. The plan will be implemented for all ongoing and future projects under the Pipeline project plan of operations.

3 DESCRIPTION OF ALTERNATIVES, INCLUDING THE PROPOSED ACTION

3 DESCRIPTION OF ALTERNATIVES, INCLUDING THE PROPOSED ACTION

3.1 Introduction

The Proposed Action is the proposal by Cortez Gold Mines, Inc. (CGM) to develop the South Pipeline Project (Project) as an expansion of the existing CGM Pipeline project and a modification of a portion of the Gold Acres Facilities (CGM 1996). The actions associated with the Project would consist of development of the South Pipeline ore deposit, (which is contiguous with and encompasses the Pipeline ore deposit), and construction of associated processing and heap leach facilities. CGM plans to conduct certain activities at the approved Cortez Facilities without modification to these facilities. In addition, the Proposed Action includes a right-of-way (ROW) application for a water pipeline (CGM 1999).

The purpose of the Project is to continue to extract gold and incidental silver from mined ore within the South Pipeline Project Area (Project Area). The life of the Proposed Action would be 10 years. The combined life of the Pipeline and South Pipeline projects would total approximately 18 years. The South Pipeline ore deposit would account for an additional eight years of mining and two years of processing beyond the eight years of mining and processing outlined in the Pipeline FEIS (BLM 1996a; page 2-9).

Principal components of the Proposed Action include the following: (a) an expansion of the Pipeline open pit which would eventually include the South Pipeline open pit; (b) a new heap leach facility; (c) an expansion of the existing Pipeline waste rock dump; (d) an expansion of the existing Pipeline tailings facility; (e) an extension of process solution pipelines from the South Pipeline leach facility to other process facilities within the Project Area; (f) new ore and sub-grade ore and growth media stockpiles (Figures 3.1.1 and 3.1.2); (g) increased Pipeline mill throughput; (h) construction of new ground water extraction wells; (i) increased rate of ground water pumping and disposal from 30,000 gallons per minute (gpm) to a maximum annual average of 34,500 gpm; (j) a larger area of surface disturbance within the Project Area; (k) rerouting to the east an existing portion of the Cortez Mine Road; (l) abandonment of a portion of the ROW for the Gold Acres haul road in the Project Mine and Process Area; (m) application of ROW for an irrigation pipeline to Dean Ranch; and (n) the option of delivering up to 6,000 gpm (annualized) to the adjacent Dean Ranch, via the ROW, which would be consumptively used. The Proposed Action would also utilize, without modification, many of the same existing CGM facilities or equipment used for other CGM operations, including the Cortez continuous fluid bed (CFB) roaster, Carbon-in-leach (CIL) mill and tailings facility, and the Pipeline ancillary facilities (administrative offices and support facilities, fresh water production supply wells, power supply and utilities, waste disposal and sanitary systems, chemical storage and hazardous material management facilities, production dewatering wells, turbine pumps, main discharge lines, conveyance lines and infiltration basins, roads, fencing, and security and fire protection systems) (Figure 3.1.2). The use and occupancy of these facilities will be in compliance with 43 Code of Federal Regulations (CFR) 3715, which regulates the storage of equipment and supplies; occupancy of structures; and structures on public land which restrict public access.

The Proposed Action will not alter the average mining rate currently used by CGM within the Pipeline mine and process area. The average daily mining rate would continue at up to approximately 150,000 tons per day (tpd), with the exception that advanced pre-strip requirements would result in higher daily average mining rates until the top of the ore body was exposed. The maximum daily mining rate would be approximately 250,000 tpd during pre-stripping.

Following approval of the Proposed Action, mining would occur in the Pipeline and/or South Pipeline open pits at any time. Any combination of Pipeline and South Pipeline ore and/or waste would be handled.

An estimated 150 million tons of ore would be mined from the South Pipeline open pit as part of the Proposed Action. A portion of this ore would be leached on new heap leach pads; the remainder would be processed at the approved Pipeline mill and tailings facility and at the existing Cortez CFB roaster, CIL mill, and tailings facility. The Pipeline tailings facility would be expanded to accommodate the ore tonnage projected to be mined from the South Pipeline deposit. The waste-to-ore ratio is approximately 3:1, resulting in approximately 450 million tons of waste rock that would also be mined from the South Pipeline open pit. The waste rock would be placed in the Project waste rock dump, which would be an expansion of the approved Pipeline waste rock dump. The Proposed

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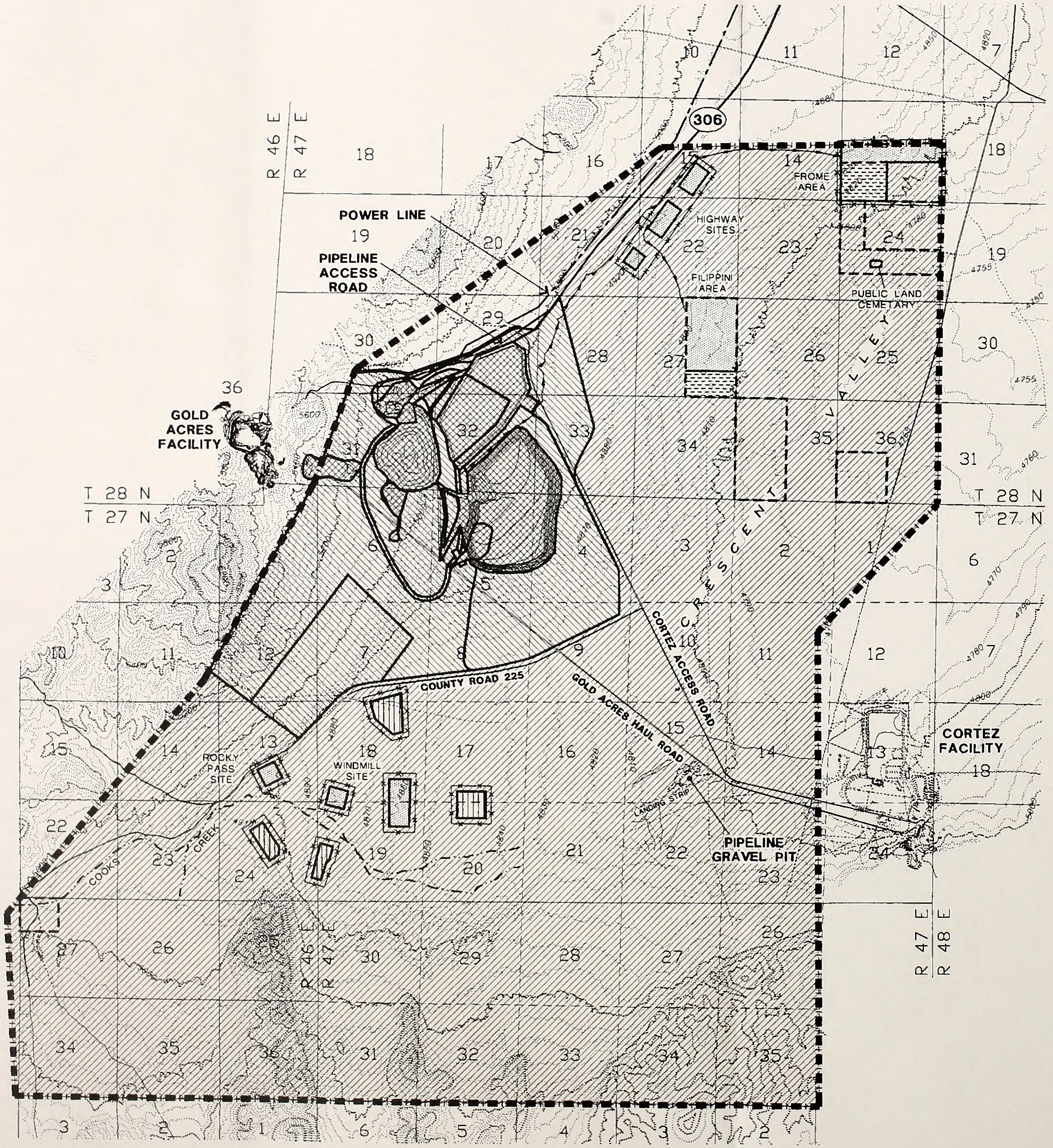
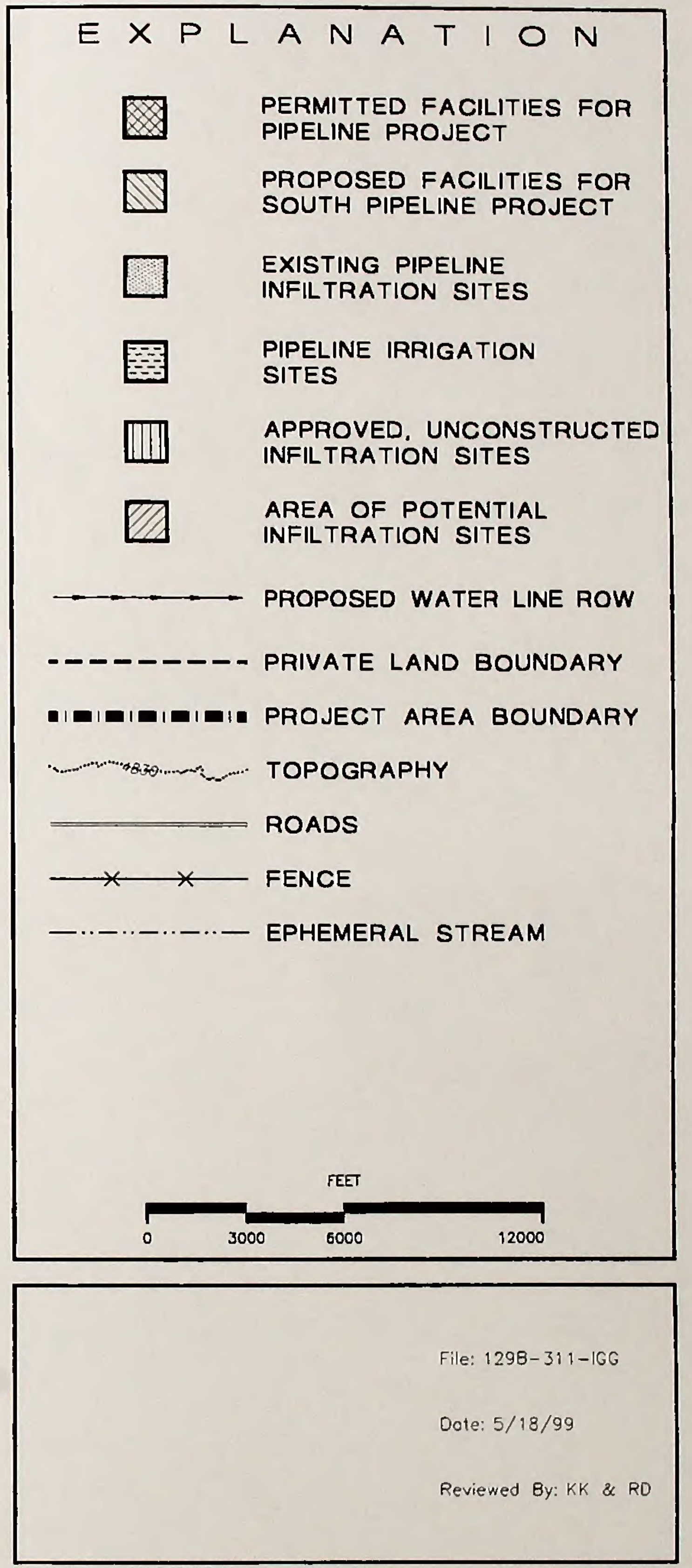
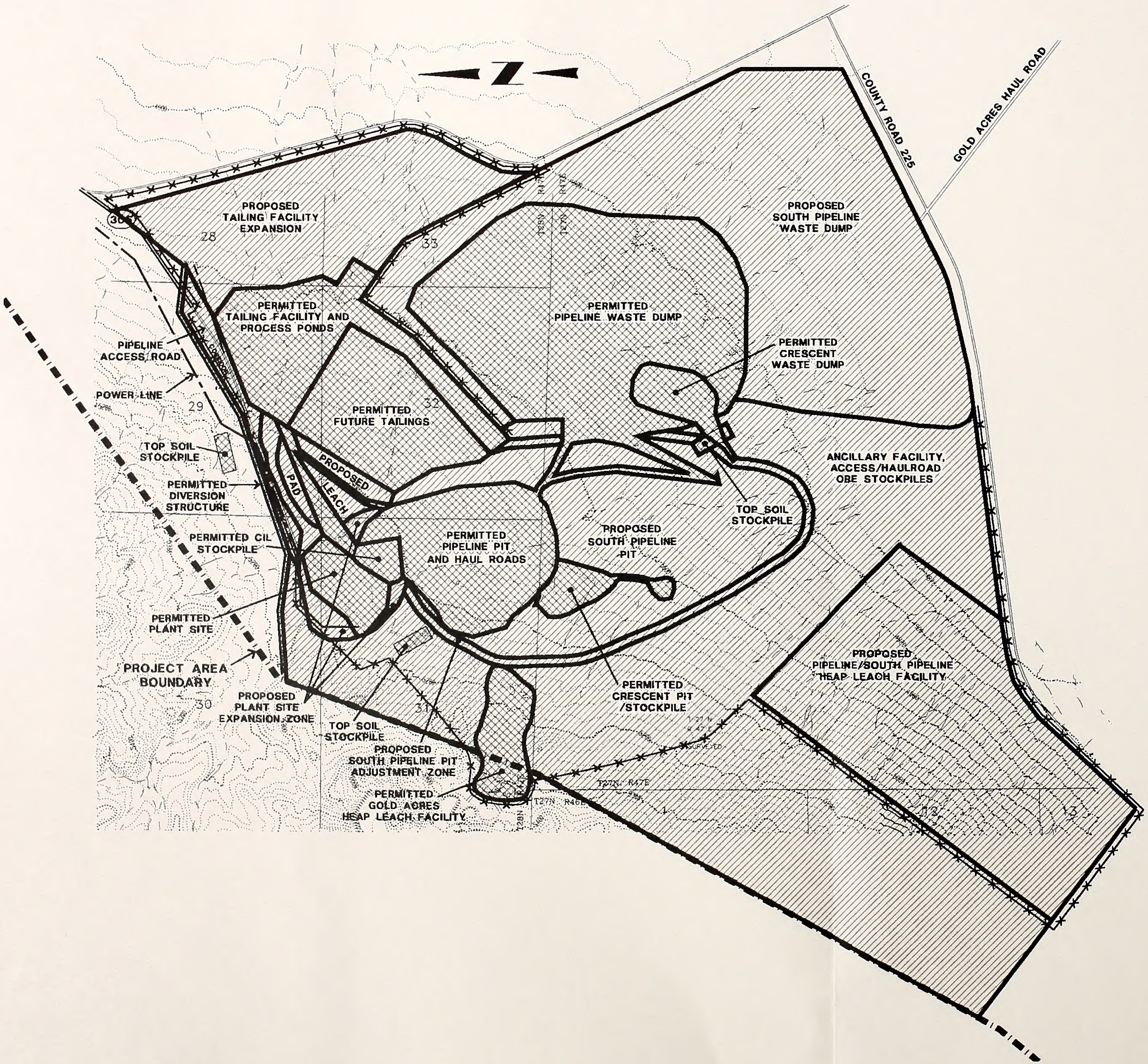




PERMITTED AND PROPOSED FACILITIES WITHIN THE PROJECT AREA

Figure 3.1.1



EXPLANATION

PERMITTED FACILITIES FOR PIPELINE PROJECT

PROPOSED FACILITIES FOR SOUTH PIPELINE PROJECT

PROJECT AREA BOUNDARY

TOPOGRAPHY

ROADS

FENCE

FEET

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Reviewed By: KK & RD

PERMITTED AND PROPOSED FACILITIES IN THE PROJECT MINE AND PROCESS AREA

Figure 3.1.2

Action would create a maximum of approximately 4,450 acres of new surface disturbance within the Project Area, creating a total of approximately 7,616 acres of surface disturbance associated with CGM's operations within the Project Area. The distribution of this surface disturbance between the various Project components is presented in Table 3.1.1, which also presents the existing/previously approved surface disturbance within the Project Area.

3.2 South Pipeline Open Pit

The South Pipeline open pit would be located south of the existing Pipeline open pit. The open pit would encompass the existing Crescent open pit and join with and encompass the Pipeline open pit (Figure 3.1.2). New surface disturbance would be approximately 530 acres. In addition, there would be a 200-foot wide pit adjustment zone around the engineered rim of the South Pipeline open pit (totaling approximately 75 acres) within which the rim of the pit could be laid back if required for safety or engineering considerations. The pit rim would be at an elevation of 5,060 feet above mean sea level (amsl) and the bottom of the pit at approximately 4,240 feet amsl. The current plan for the completion of the South Pipeline open pit would result in a single open pit with an irregular bottom that generally shallows from north to south. Approximately 150 million tons of ore and 450 million tons of waste rock would be mined from the South Pipeline open pit under the Proposed Action, although economic conditions could modify the pit configuration and tonnages mined during the life of the Project.

Following the completion of mining and the termination of dewatering/ground water pumping (see Section 3.3.1), the residual open pit would become filled with water to an elevation of approximately 4,780 ± 5 feet amsl.

3.2.1 Mining Methods

The South Pipeline deposit would be mined using the same conventional open pit methods and equipment as are used to mine the Pipeline deposit. Mining would consist of drilling, blasting, loading, and hauling of the ore and waste rock. Mining operations would produce mill-grade ore, heap leach-grade ore, minor amounts of refractory-grade ore, and waste rock. Mining operations would be conducted 24 hours per day, seven days per week.

The material to be mined would be drilled for blasting using diesel-powered blast hole drill rigs. Blast holes would be loaded with an ammonium nitrate/fuel oil (ANFO) mixture or water resistant blasting agent. Blasting would take place only during daylight hours, and would be conducted under strict Mine Safety and Health Administration (MSHA) safety procedures.

Electric or hydraulic shovels or hydraulic front end loaders would load blasted rock into 85-ton to 310-ton haul trucks. Waste rock would be hauled over proposed and existing haul roads to the South Pipeline Waste Dump (expanded Pipeline waste rock dump) (see Section 3.4). Ore would be hauled over proposed and existing haul roads to the processing facility appropriate for the type and grade of ore (Section 3.5).

3.2.2 Slope and Slope Stability

The overall highwall slope angles of the South Pipeline open pit are expected to range between 38 and 50 degrees. Actual slope angles would be subject to engineering studies, conditions encountered during actual mining operations, and MSHA regulations and guidelines.

Pit slope configuration (Figure 3.2.1) would be controlled by several parameters and include: (a) the geologic and geotechnical characteristics of the wall rock; b) equipment constraints; and (c) safe operating practices. The open pit slopes (highwall) would also be a function of the geometry of the ore body. Pit bench heights and widths would be specifically designed to conform to the conditions encountered, sound engineering practices, economics, and proposed environmental protection measures. Bench heights would also be determined by mining equipment limitations and characteristics of the gold mineralization.

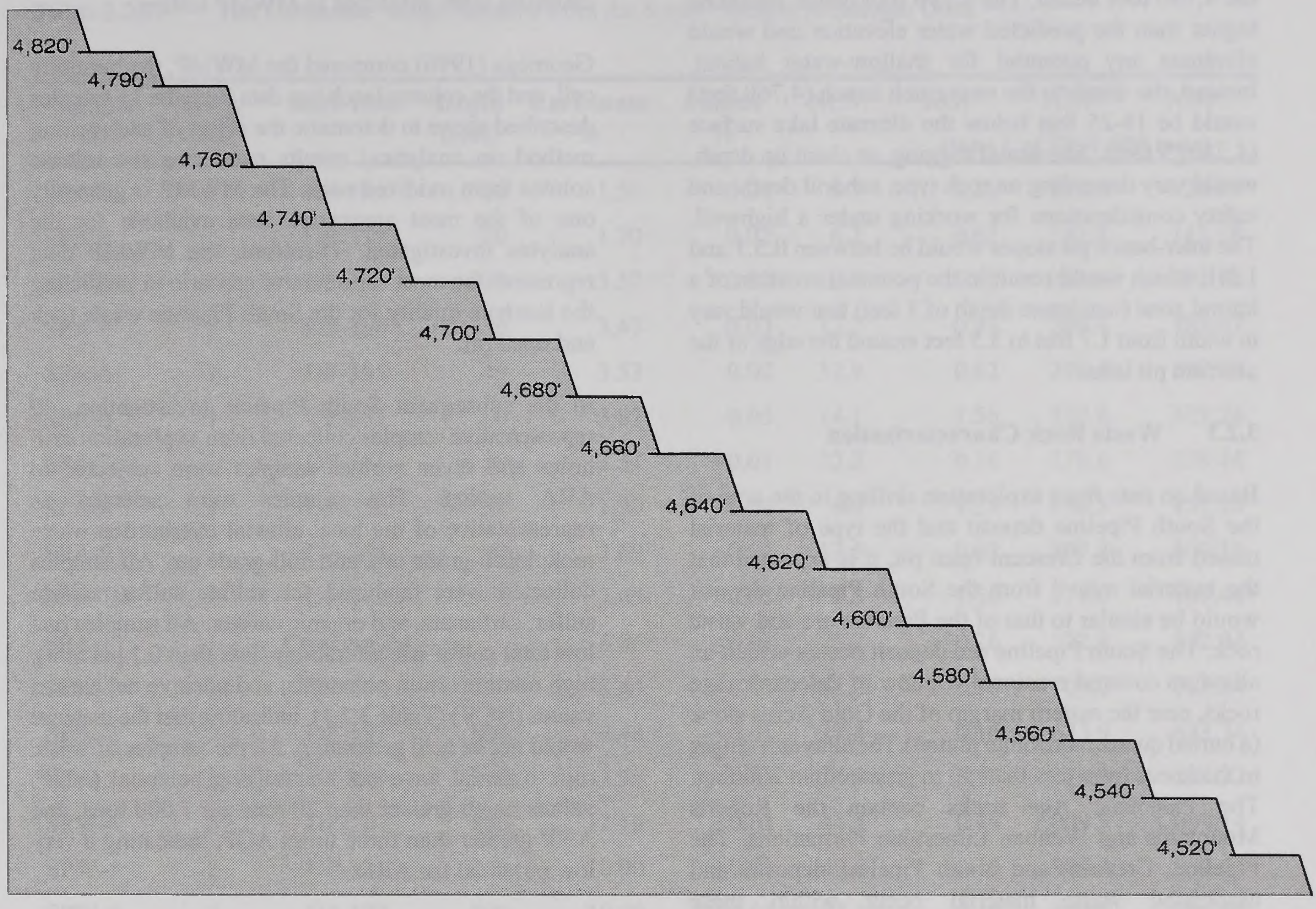
As mining progresses, an ongoing geotechnical program would be conducted to confirm the assumptions made and the validity of the slope design. The geologic and geotechnical characteristics of the material exposed during mining would be monitored regularly by CGM. Geologic structural mapping and interpretation, monitoring of ground water levels in and adjacent to the open pit, and analyses of slope stability would be the basic elements for this geotechnical program. In addition, operational procedures for controlled blasts, or other methods, would be instituted to facilitate the creation of stable pit walls.

At the time of pit wall construction, the open pit bench configuration would be altered near the expected pit lake elevation of approximately 4,780 ± 5 feet to ensure that the littoral zone is minimized (which would minimize the formation of rooted aquatic plants). The

Table 3.1.1: Summary of Existing and Proposed Surface Disturbance

	Mine Facility Component	Disturbed Acres Approved	Disturbed Acres Proposed Action	Disturbed Acres Combined Total
MINE AND PROCESS AREA				
Pits	Crescent Open Pit[a]	40		40
	Pipeline Pit/Haul Roads	276		276
	South Pipeline Open Pit		530	530
	South Pipeline Adjustment Zone		75	75
	Subtotal:	**316**	**605**	**921**
Ore and Process Facilities	Pipeline Plant Site	56		56
	Plant Expansion / Ore Stockpile	19	58	77
	Pipeline/South Pipeline Tailings	444	434	878
	Pipeline Heap Leach Expansion		54	54
	Pipeline/South Pipeline Heap Leach Facility		758	758
	Gold Acres Heap Leach	49		49
	Subtotal:	**568**	**1,304**	**1,872**
Waste Rock Dumps	Crescent Waste Rock Dump[b]	50		50
	Pipeline Waste Rock Dump	667		667
	South Pipeline Waste Rock Dump		1,096	1,096
	Subtotal:	**717**	**1,096**	**1,813**
Support Facilities	Soil Stockpiles	18		18
	Plant Area Roads	31		31
	Plant Access Corridor		56	56
	Gravel Pit	100		100
	Ancillary Facilities[c]	362	1,302	1,664
	County Road Construction/Cortez Access Road Relocations	29	37	66
	Drainage Diversions	21		21
	Subtotal:	**561**	**1,395**	**1,956**
	Total Mine and Process Area:	**2,162**	**4,400**	**6,562**
OTHER AREAS OF DISTURBANCE WITHIN THE PROJECT AREA				
Exploration Activities		48	50	98
Mine Water Infiltration Basins/Pipe Lines/Ditches		956	0	956
	Total Ancillary Area:	**1,004**	**50**	**1,054**
	TOTAL PROJECT AREA SURFACE DISTURBANCE:	**3,166**	**4,450**	**7,616**

[a] Approved disturbance is 54 acres, additional 14 acres included under Ancillary Facilities.
[b] Approved disturbance is 114 acres, additional 64 acres included under Ancillary Facilities.
[c] Ancillary Facilities area identified on Figure 3.1.2 covers 1,664 acres, which includes 362 acres of approved, but not otherwise identified, disturbance.



EXPLANATION

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Typical Pit Slope Configuration

Figure 3.2.1

SOUTH PIPELINE PROJECT EIS

nearest designed variable-width catch bench would be the 4,790 foot bench. The 4,790 foot bench would be higher than the predicted water elevation and would eliminate any potential for shallow-water habitat. Instead, the depth to the next catch bench (4,760 feet) would be 15-25 feet below the ultimate lake surface (4,780±5 feet). The actual digging, or clean up depth, would vary depending on rock type, subdrill depth, and safety considerations for working under a highwall. The inter-bench pit slopes would be between 0.5:1 and 1.3:1, which would result in the potential creation of a littoral zone (maximum depth of 3 feet) that would vary in width from 1.7 feet to 3.5 feet around the edge of the ultimate pit lake.

3.2.3 Waste Rock Characterization

Based on data from exploration drilling in the area of the South Pipeline deposit and the type of material mined from the Crescent open pit, it is expected that the material mined from the South Pipeline deposit would be similar to that of the Pipeline ore and waste rock. The South Pipeline ore deposit occurs within an alluvium covered erosional window of Paleozoic Age rocks, near the eastern margin of the Gold Acres stock (a buried quartz monzonite pluton).The alluvium ranges in thickness from less than 50 to greater than 200 feet. The Paleozoic Age rocks contain the Roberts Mountains and Wenban Limestone Formations. The Pipeline, Crescent and South Pipeline deposits and associated waste material occur within these formations.

The South Pipeline waste rock dump would consist of alluvial overburden and calcareous siltstone excavated from the South Pipeline open pit. Waste rock would be comprised of approximately 40 percent alluvial material and 60 percent calcareous siltstone.

The potential for acid rock drainage (ARD) and metals leaching from the Pipeline Project ore and waste rock were initially evaluated by static acid-base accounting (ABA) testing of 32 samples to determine the potential impacts to water resources for the Pipeline FEIS (BLM 1996a). The source document for the information presented in the FEIS was *Summary of Baseline Chemistry Data and Assessment of the Hydrochemistry of the Final Pit* (WMC 1995a). Eleven samples representative of waste rock, leach-grade ore, and mill grade ore were subjected to the Nevada Division of Environmental Protection (NDEP) Meteoric Water Mobility Procedure (MWMP). The MWMP is used to evaluate the potential for leaching of solutes from mine waste materials. In addition to the above testing, five rinsed metallurgical test samples of heap leach-grade materials were subjected to MWMP testing.

Geomega (1996) compared the MWMP, the humidity cell, and the column leach test data from the 11 samples described above to determine the effect of each testing method on analytical results measuring the release solutes from oxidized rock. The MWMP is generally one of the most aggressive tests available for the analytes investigated. Therefore, the MWMP data represents the most conservative scenario in predicting the leachate quality for the South Pipeline waste rock and open pit.

In the subsequent South Pipeline investigation, 40 representative samples collected from exploration drill holes and seven surface samples were subjected to ABA testing. The samples were selected as representative of the local alluvial overburden waste rock, leach-grade ore, and mill-grade ore. All samples collected were analyzed for sulfate sulfur, sulfide sulfur, carbonate, and organic carbon. All samples had low total sulfur concentrations (less than 0.1 percent), high neutralization potentials, and positive net carbon values (NCV) (Table 3.2.1), indicating that the material would not be acid generating. All the samples of waste rock material have net neutralizing potential (NNP) values much greater than 20 tons per 1,000 tons, and ANP greater than three times AGP, indicating a very low potential for ARD.

Twenty-five humidity cell tests and nine field oxidation tests were conducted on the material from the South Pipeline lithologic units (Table 3.2.1). In addition, in situ percolation samples were collected for the Crescent pit waste rock dump, which is composed of the same rock types as the South Pipeline waste dump. The source document for this information was *South Pipeline Project Waste Rock Dump Study* (Geomega 1997).

Geomega compared the analytical results for the Pipeline and South Pipeline lithologies and determined that they are consistent and representative of the lithology that will be present in the ultimate pit surface (UPS).

The acid generating potential (AGP) of waste rock handled as a result of the Proposed Action would be monitored during mining and disposal. Waste rock would be characterized according to final closure procedures set forth by NDEP.

Table 3.2.1: Net Carbonate Value Samples from the South Pipeline Lithologic Units

Sample ID	Rock Code[a]	Bore Hole	Depth (feet)	Carbonate %	Sulfide %	NCV[b]	AGP[b]	ANP[b]	NNP[b]
							(tons $CaCO_3$/1,000 tons)		
SPA-1	1	DP-335	20	1.55	0.01	5.7	0.31	129.3	128.99
SPA-2	1	DP-337	20	1.70	0.02	6.2	0.62	141.8	141.18
SPA-3	1	DP-342	30	3.52	0.02	12.9	0.62	293.6	292.98
SPA-4	1	DP-360	30	3.47	0.03	12.7	0.93	289.4	288.47
SPA-5	1	DP-355	40	3.53	0.02	12.9	0.62	298.4	297.78
SPA-6	1	DP-357	0	3.87	0.05	14.1	1.56	322.8	321.24
SPA-7	1	DP-341	20	3.34	<0.01	12.2	0.16	278.6	278.44
SPA-8	1	DP-350	30	1.90	0.04	6.9	1.25	158.5	157.25
SPA-9	1	DP-358	40	3.69	0.02	13.5	0.62	307.8	307.18
SPA-10	1	DP-349	10	2.05	0.05	7.5	1.56	171.0	169.44
SPA-11	1	Crescent Pit		6.86	<0.01	25.2	0.16	572.2	572.04
SPW-1	3	DP-164	610	8.44	<0.01	31.0	0.16	704.0	703.84
SPW-2	3	DP-191	500	7.48	<0.01	27.4	0.16	623.9	623.74
SPW-3	3	DP-139	340	3.95	<0.01	14.5	0.18	329.5	329.32
SPW-4	3	DP-167	350	12.10	<0.01	44.4	0.16	1,009.3	1,009.14
SPW-5	3	DP-186	300	10.90	<0.01	40.0	0.16	909.2	909.04
SPW-6	3	DP-173	700	10.20	<0.01	37.4	0.16	850.8	850.64
SPW-7	3	DP-125	320	0.56	<0.01	2.0	0.16	46.7	46.54
SPW-8	3	DP-152	900	3.81	<0.01	14.0	0.16	317.8	317.64
SPW-9	3	DP-232	500	8.05	<0.01	29.5	0.16	671.4	671.24
SPW-10	3	DP-196	750	8.58	<0.01	31.5	0.16	715.7	715.54
SPW-11	3	DP-163	620	7.89	<0.01	28.9	0.16	658.1	657.94
SPW-12	3	DP-231	305	9.59	<0.01	35.2	0.16	799.9	799.74
SPW-13	3	Crescent Pit		8.26	<0.01	30.3	0.16	689.0	688.84
SPW-14	3	Crescent Pit		7.45	<0.01	27.3	0.16	621.4	621.24
SPW-15	3	Crescent Pit		10.10	<0.01	37.1	0.16	842.9	842.74
SPW-16	4	DP-232	280	5.99	<0.01	22.0	0.16	499.7	499.54
SPWS-1	5	Crescent Pit		0.36	<0.01	1.3	0.16	30.0	29.84
SPWC-1	9	DP-232	1,100	5.79	0.11	21.1	3.43	483.0	479.57
SPWC-2	9	DP-216	600	8.27	<0.01	30.3	0.16	689.8	689.64
SPWC-3	9	Crescent Pit		8.31	<0.01	30.5	0.16	693.1	692.94
SPWD-1	7	Crescent Pit		8.01	<0.01	29.4	0.6	668.1	667.5

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Sample ID	Rock Code	Bore Hole	Depth (feet)	Carbonate %	Sulfide %	NCV	AGP	ANP	NNP
							(tons $CaCO_3$/1,000 tons)		
SPH-1	6	DP-164	700	7.80	<0.01	28.6	0.16	650.6	650.44
SPH-3	4	DP-139	175	1.30	0.02	4.7	0.62	108.5	107.88
SPH-4	6	DP-186	530	9.22	<0.01	33.8	0.16	769.0	768.84
SPH-5	5	DP-173	660	3.62	<0.01	13.3	0.16	302.0	301.84
SPH-6	6	DP-125	620	6.64	<0.01	24.4	0.16	553.8	553.64
SPH-7	7	DP-232	730	4.00	<0.01	14.7	0.16	333.7	333.54
SPH-8	6	DP-196	660	9.53	<0.01	35.0	0.16	794.9	794.74
SPH-9	8	DP-218	430	0.29	<0.01	1.1	0.16	24.2	24.04
SPM-1	8	DP-191	230	0.89	<0.01	3.3	0.16	74.3	74.14
SPM-3	6	DP-186	430	7.60	<0.01	27.9	0.16	633.0	632.84
SPM-4	7	DP-152	580	6.25	<0.01	22.9	0.16	521.3	521.14
SPM-5	5	DP-196	1,050	0.09	<0.01	0.3	0.16	7.5	7.34
SPM-6	6	DP-189	910	5.65	<0.01	20.7	0.16	471.3	471.14
SPM-7	8	DP-169	550	0.05	<0.01	0.2	0.16	4.2	4.04
SPM-8	8	DP-218	510	9.09	<0.01	33.4	0.16	758.2	758.04

[a] Rock code: 1 = alluvium; 2 = mineralized alluvium; 3 = calcareous siltstone; 4 = argillized siltstone; 5 = silicified siltstone; 6 = oxidized microbreccia; 7 = decalcified siltstone; 8 = sheared zones; 9 = carbonaceous siltstone.

[b] NCV = net carbonate value; AGP = acid generation potential; ANP = acid neutralization potential; NNP = net neutralization potential.

3.3 Dewatering and Water Disposal Operations

3.3.1 Dewatering Operations

Under the Proposed Action CGM would conduct dewatering operations of sufficient capacity to allow for the planned mining of the South Pipeline deposit Table 3.3.1 presents the anticipated annual average dewatering rates, in gpm, to conduct the planned mining activities based on an evaluation of the hydrogeology of the area. According to hydrologic modeling (Geomega 1998a), dewatering rates for the first six years of the expected 13 years of dewatering for the combined Pipeline and South Pipeline dewatering are the same (accounting for numerical roundoff) as under the Existing Facilities Chapter (Section 2.3.1). As a result, the Proposed Action would extend the time period over which dewatering operations would occur.

As seen from the current dewatering operations and shown in the recent hydrologic modeling, dewatering of the South Pipeline open pit would be largely accomplished during the dewatering of the approved Pipeline open pit. Additional dewatering wells peripheral to and within the South Pipeline open pit would be necessary to accomplish adequate dewatering due to local hydrologic conditions. The dewatering wells, piping, and associated components would be installed in essentially the same manner as those associated with the Pipeline project.

Mine dewatering is expected to provide water of adequate quality and sufficient quantity to supply mining, milling, and non-potable service needs for both the Project and the other ongoing CGM operations.

3.3.2 Water Disposal Operations

Under the Proposed Action, CGM proposes to manage water encountered in the additional eight years of dewatering through infiltration water disposal operations through the use of the authorized Pipeline water disposal operations. In addition, CGM proposes the following: (a) the option to deliver 6,000 gpm (annualized) to the adjacent Dean Ranch via a proposed pipeline (see section 3.7 regarding pipeline ROW); and (b) a water management option, subject to formal

Table 3.3.1: Modeled Dewatering Rates for the Mining of the South Pipeline Ore Deposit

Time Year	Dewatering (gpm)[a]
0	4,100
1	15,850
2	25,150
3	16,800
4	15,850
5	21,700
6	17,700
7	20,950
8	13,100
9	16,150
10	17,900
11	5,100
12	10,450
13	13,700

[a] Includes dewatering for mining of the Pipeline Ore Deposit

feasibility analysis, of injecting a percentage of the water from the dewatering operations (approximately 5,000 to 10,000 gpm).

3.3.2.1 Monitoring

Monitoring of the dewatering and water disposal system under the Proposed Action would continue as described in Section 2.3.2.2, but would be expanded to cover additional activities under the Proposed Action.

3.3.2.2 Dean Ranch Water Delivery

The option of delivering 6,000 gpm (annualized) of dewatering water to the Dean Ranch which would be consumptively used. Activities at the ranch would not result in surface discharge of water to public lands.

3.3.2.3 Injection Wells

As an option for water disposal operations, CGM has implemented an assessment of the viability of injection wells for disposal of a portion of the water generated from dewatering operations. The first phase of this assessment is presented in *Pipeline Injection Viability Report* (Geomega 1998e).

The Injection Option would involve the construction of a system to re-inject pumped water into valley alluvial deposits via a well field. Water would be piped to the injection well field or fields from the pit dewatering pumps. The injection well fields would handle a portion of the dewatering water and would be utilized, if feasible, in conjunction with infiltration basins. The implementation of injection wells would be dependent upon additional, detailed feasibility and engineering studies, as well as pre-construction test injection wells to ascertain potential operating efficiencies. Total disturbance for injection wells is estimated at 50 acres. This acreage would be included in the Pipeline and South Pipeline surface disturbance (Figure 2.2.1).

3.4 Waste Rock Disposal

As part of the Proposed Action, waste rock mined from the South Pipeline open pit would be disposed of as follows: (a) in the South Pipeline waste rock dump (an expansion of the Pipeline waste rock dump); (b) as backfill in the Pipeline open pit; or (c) using a combination of the two locations.

3.4.1 South Pipeline Waste Rock Dump

To accommodate the waste rock mined during the development of the South Pipeline ore deposit (up to 450 million tons), the South Pipeline waste rock dump would be created by expanding the existing Pipeline waste rock dump, generally from north to south (Figure 3.1.2). Surface disturbance associated with the construction of the South Pipeline waste rock dump would be approximately 1,096 acres, based upon current designs and using a 30 percent swell factor for the mined material.

The South Pipeline waste rock dump would be constructed by end dumping from haul trucks. Wherever feasible, the South Pipeline waste rock dump would be designed and built as terraced structures to facilitate eventual recontouring and reclamation. Each terrace would be limited to a maximum height of 200 feet and developed by end dumping from the top of the active dump face, creating a working-face angle equal to the angle of repose, or approximately 38 degrees. The maximum height of the South Pipeline waste rock dump would be 250 feet, depending on local topographic conditions (Figure 3.4.1).

The South Pipeline waste rock dump expansion would be engineered and constructed in a manner to ensure long-term stability, provide for concurrent and final reclamation, and reduce the overall visual impacts. Waste rock material would consist primarily of alluvium and oxidized calcareous siltstone. Alluvium which has been used successfully as a growth medium for vegetation, would be utilized to facilitate reclamation where possible by selectively placing along dump margins, and/or be stockpiled to provide adequate cover material for reclamation (Figure 3.1.2).

The ARD potential of the material to be mined is low, therefore, encapsulation of waste rock is not proposed. In the event that acid generating waste rock is locally encountered during mining, internal sections of the South Pipeline waste rock dump would be utilized to isolate and/or appropriately mix with neutralizing high-carbonate material.

Sediment control structures would be designed to prevent excessive erosion. In addition, the waste rock dump expansion would be visually monitored following spring snow melt and intense rain events to ensure that drainage and sediment control measures were effective.

3.4.2 Partial Backfilling Option

During the operation of the South Pipeline open pit, CGM, with concurrence from the BLM, may determine based on engineering and economic considerations that disposal of a portion of the South Pipeline waste rock in the Pipeline open pit is feasible and environmentally sound. If this option were to occur, the waste rock would be hauled to a mined-out portion of the Pipeline open pit. The majority of the waste would be deposited at the bottom of the pit. Dumping over the pit rim may also be considered to fill the catch benches on the upper portion of the pit wall, including the area adjacent to the ultimate pit lake level. This would result in inter-bench slopes of 1.3:1, which is consistent with the discussion the slope and slope stability section (Section 3.2.2). It is estimated that up to 90 million tons of waste rock would possibly be disposed of at this location.

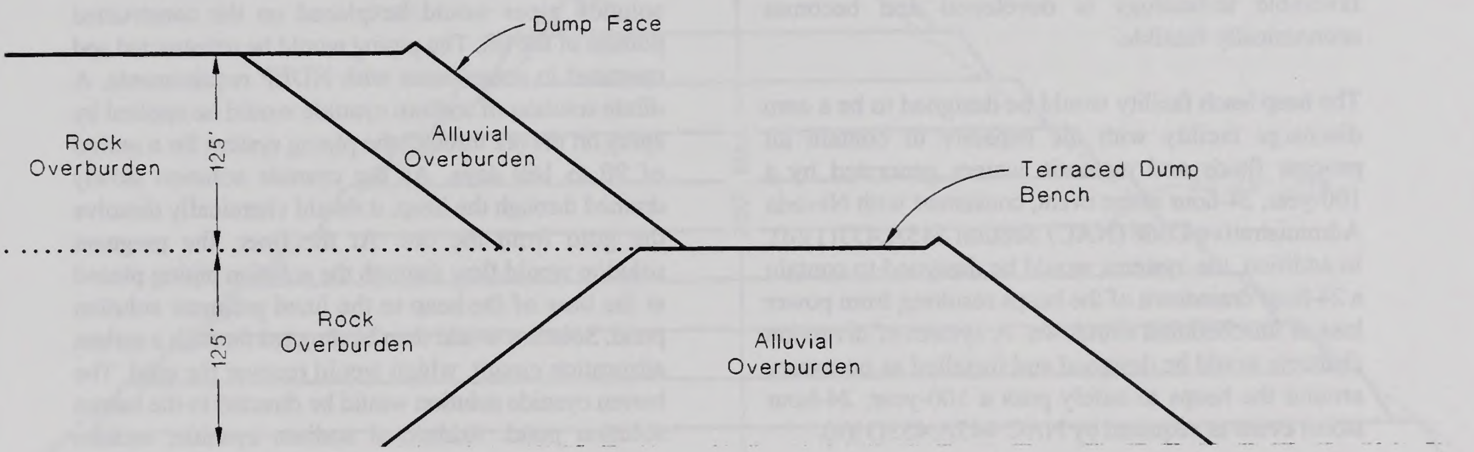
3.5 Ore Processing Facilities

Ore would be hauled from the South Pipeline open pit to the processing facility appropriate for the ore grade and processing requirements. Lower grade oxide ore would be hauled directly to the new South Pipeline heap leach facility or the expanded Pipeline heap leach facility. Mill-grade ore would be hauled to the Pipeline mill or Cortez mill and tailings facility (or the ore stockpile for the Pipeline mill and tailings facility). Refractory ore would be hauled to the Cortez CFB roaster, CIL mill, and tailings facility.

3.5.1 Heap Leach Facility

CGM is proposing to construct a heap leach facility which would consist of an engineered leach pad connected to lined solution ponds and a lined stormwater overflow pond located downgradient of the leach pad (Figure 3.1.2). A carbon adsorption facility and reagent-addition tanks would also be located near the solution ponds. The total proposed disturbance associated with South Pipeline heap leach and support facilities would be a maximum of 758 acres. In addition, CGM proposes a 54-acre expansion to the existing Pipeline heap leach facility.

CGM, during the life of the Project, would evaluate alternative locations within the permitted disturbance plan of the Project Mine and Process Area. In order to minimize disturbance and/or maximize economic benefits heap leach pads to process leach grade material may be placed on top of an area of the Pipeline/South Pipeline waste rock dump provided that it is technically feasible, economically viable, and does not impact closure of the heaps. Under this option the



Not to Scale
All Dimensions Approximate

EXPLANATION

EXISTING TOPOGRAPHY

PROPOSED TOPOGRAPHY

Drowing by Cortez
Gold Mines, 1996.

File: 1298-341-IGG
Date: 5/18/99
Reviewed By: KK & RD

TYPICAL DUMP SLOPE CONFIGURATION

Figure 3.4.1

process facility, including the ponds, would most likely be placed on natural ground in close proximity to the waste rock dump. The final engineering study would determine the location of the process facility.

A portion of mineralized material that would be mined from the South Pipeline open pit is low grade refractory ore. Technology in bio-leaching of this type of ore is currently being developed in the mining industry. Bio-leaching is a process where ore is placed on a heap leach pad and then treated by introducing naturally occurring bacteria in solution that will partially breakdown the sulfide mineralization and free a portion of the gold associated with the sulfides. The material is then leached using the standard heap leach process. A portion of the new heap leach pad in the Proposed Action may be utilized for the bio-leach process if favorable technology is developed and becomes economically feasible.

The heap leach facility would be designed to be a zero discharge facility with the capacity to contain all process fluids and meteoric waters generated by a 100-year, 24-hour storm event, consistent with Nevada Administrative Code (NAC) Section 445A.433(1)(d). In addition, the systems would be designed to contain a 24-hour draindown of the heaps resulting from power loss or unscheduled shutdown. A system of diversion channels would be designed and installed as necessary around the heaps to safely pass a 100-year, 24-hour storm event as required by NAC 445A.433(1)(c).

The heap leach pads would be constructed in compliance with NAC 445A.433(2). The leach pad areas would be cleared of brush, stripped of topsoil, graded and prepared for liner placement. Leach pad site leveling and grading would be performed to control solution flows and establish a stable downhill toe area for the ore heap.

A composite system with leak detection devices would be utilized for the heap liner. The primary liner would be a 60-mil high density polyethylene (HDPE) geomembrane. The liner would be placed on a minimum thickness of 12 inches of fine-grained soil that would be compacted in place to provide a permeability of 1 x 10^{-6} centimeters per second (cm/sec). Solution collection ditches would be lined with an 80-mil HDPE geomembrane primary liner.

Barren and pregnant solution ponds and a stormwater overflow pond would be constructed downgradient of the pad area. The double-liner system for the barren and pregnant ponds would consist of a 60-mil HDPE geomembrane primary liner over a 40-mil geomembrane secondary liner with an intervening geonet drainage layer.

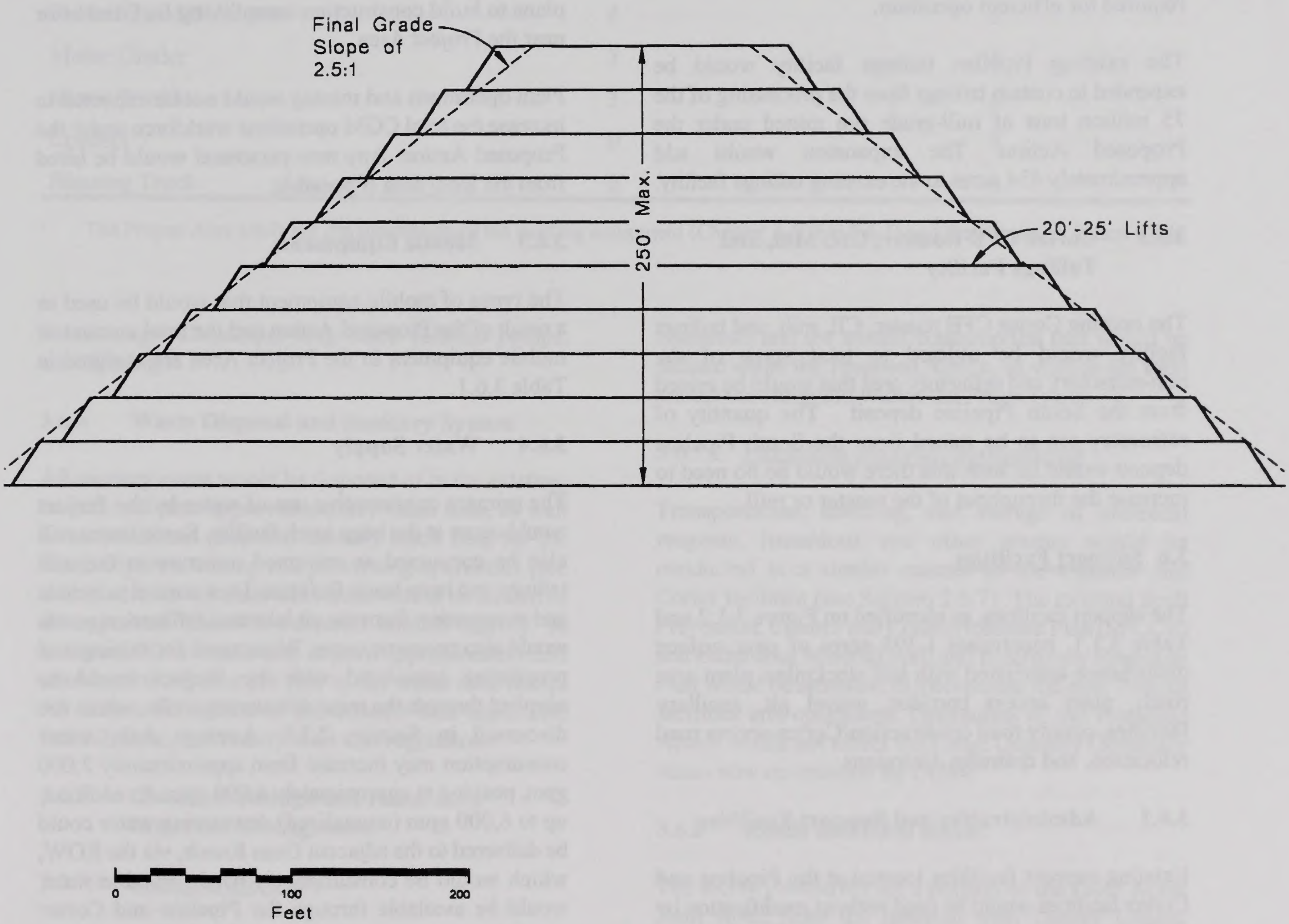
Run-of-mine or crushed ore would be placed on the constructed pad using mine haul trucks or conveyors. The South Pipeline heap leach facility would be designed to contain heap leach-grade ore and would be constructed in phases to accommodate identified heap leach ore to be processed. In addition, heap leach material may be processed at the Pipeline heap leach facility, requiring a 54-acre leach pad expansion.

The ore would be stacked in lifts approximately 20 to 25 feet high, with a maximum overall height of 250 feet and overall side slopes no steeper than 2.5h:1v (Figure 3.5.1). Once a lift was completed, a system of solution pipes would be placed on the constructed portion of the lift. The piping would be constructed and operated in compliance with NDEP requirements. A dilute solution of sodium cyanide would be applied by spray on the ore through the piping system for a period of 90 to 160 days. As the cyanide solution slowly drained through the heap, it would chemically dissolve the gold from the ore. At the liner, the pregnant solution would flow through the solution piping placed at the base of the heap to the lined pregnant solution pond. Solution would then be directed through a carbon adsorption circuit, which would recover the gold. The barren cyanide solution would be directed to the barren solution pond. Additional sodium cyanide, sodium hydroxide, and water would be added to the barren solution pond as necessary to maintain the cyanide concentration, solution pH, and volume. The barren solution would then be pumped from the pond to the top of the heap to begin the process again. Solution piping would also be constructed from the South Pipeline heap leach facility to the Gold Acres heap leach facility to allow processing of South Pipeline heap leach solutions at the Gold Acres heap leach facility.

The heap leach facilities, which include the heap leach process ponds and the heap leach pad, would be fenced. The solution ponds would be covered with HDPE floating "bird balls" or other appropriate material and fenced to exclude terrestrial and avian wildlife. Leach solution collection and conveyance ditches would also be covered with 1-inch mesh netting or solid covers to exclude wildlife.

3.5.2 Pipeline Mill and Tailings Facilities

The existing Pipeline mill and tailings facilities located in the Project Mine and Process Area would process the mill-grade ore produced from the South Pipeline



E X P L A N A T I O N

RECLAIMED TOPOGRAPHY

PROPOSED TOPOGRAPHY

File: 1298-351-IGG
Date: 5/18/99
Reviewed By: KK & RD

TYPICAL HEAP LEACH SLOPE CONFIGURATION

Figure 3.5.1

SOUTH PIPELINE PROJECT EIS

ore deposit (see Sections 2.5.1 and 2.5.2). There would be a 58-acre expansion to the plant site, which includes an addition of 6 acres to the ore stockpile area for ore to be processed through the Pipeline mill and tailings facilities, and 52 acres for potential facility expansion and flexibility for managing isolated areas of undisturbed ground. The Pipeline mill is currently operating at an average daily rate of 11,000 tpd and would increase to an average daily rate of 13,500 tpd under the Proposed Action. No significant modifications to the mill facility would be necessary to increase the throughput. The CIL ore stockpile, located adjacent to the Pipeline open pit, would be enlarged to store approximately eight million additional tons. Modification to the mill crusher stockpiles may also be required for efficient operation.

The existing Pipeline tailings facility would be expanded to contain tailings from the processing of the 75 million tons of mill-grade ore mined under the Proposed Action. The expansion would add approximately 434 acres to the existing tailings facility.

3.5.3 Cortez CFB Roaster, CIL Mill, and Tailings Facility

The existing Cortez CFB roaster, CIL mill, and tailings facility would be utilized to treat some of the non-refractory and refractory ores that would be mined from the South Pipeline deposit . The quantity of refractory ore to be mined from the South Pipeline deposit would be such that there would be no need to increase the throughput of the roaster or mill.

3.6 Support Facilities

The support facilities, as identified on Figure 3.1.2 and Table 3.1.1, encompass 1,395 acres of new surface disturbance associated with soil stockpiles, plant area roads, plant access corridor, gravel pit, ancillary facilities, county road construction/Cortez access road relocation, and drainage diversions.

3.6.1 Administrative and Support Facilities

Existing support facilities located at the Pipeline and Cortez facilities would be used without modification by the Proposed Action (see Section 2.6.1). The facilities include the administrative offices, the safety/change house, a first aid station, the mill facility, assay lab, shop/warehouse, ready line, heavy equipment and light vehicle fueling facilities, diesel and gasoline storage facilities, gas storage facility, mobile equipment, and explosives storage.

3.6.2 Work Force

Under the Proposed Action, the existing 450-500 CGM employees would have employment opportunities extended for an additional eight years. In addition, it is estimated that up to 50 contractors would be working on the Project Area at any time during the life of the Project. It is expected that a temporary construction workforce would not be necessary, except during periods of pad construction or advance pre-stripping of the pit. Existing employees currently live in the towns/communities of Crescent Valley, Beowawe, Battle Mountain, Carlin, and Elko/Spring Creek. The majority of the employees would continue to be transported by bus to the site each day. There are no plans to build construction camp living facilities at or near the Project Area.

Plant operations and mining would not be expected to increase the total CGM operations workforce under the Proposed Action. Any new personnel would be hired from the local area if possible.

3.6.3 Mobile Equipment

The types of mobile equipment that would be used as a result of the Proposed Action and the total amount of mobile equipment in the Project Area are outlined in Table 3.6.1.

3.6.4 Water Supply

The primary consumptive use of water by the Project would occur at the heap leach facility. Some water will also be consumed as entrained moisture in the mill tailings and heap leach facilities. Dust control activities and evaporation from the pit lake and infiltration ponds would also consume water. Water used for mining and processing associated with the Project would be supplied through the mine dewatering wells, which are discussed in Section 2.3.1. Average daily water consumption may increase from approximately 2,000 gpm, peaking at approximately 4,000 gpm. In addition, up to 6,000 gpm (annualized) dewatering water could be delivered to the adjacent Dean Ranch, via the ROW, which would be consumptively used. Potable water would be available through the Pipeline and Cortez potable water sources (wells) and bottled water.

3.6.5 Power Supply and Utilities

Appropriate sized transmission lines that supply power to the Pipeline facilities would be extended to the South Pipeline facilities (Figure 3.1.2). Primary uses of electricity for the Project would be for electric shovels,

Table 3.6.1: List of Mobile Equipment Projected Under the Proposed Action and the Resulting Total On-site in the Project Area

Type of Equipment	Maximum Number of Units Under Proposed Action	Maximum Number of Units in the Project Area[a]
Electric Shovels	1	3
Front Loaders / Hydraulic Shovels	1	5
Haul Trucks (180 - 310 ton)	5	20
Rotary Drills	0	5
Track Bulldozer	3	7
Rubber Tired Bulldozer	4	5
Motor Grader	3	5
Water Trucks	3	5
Loaders	0	3
Blasting Truck	0	3

[a] The Project Area totals are the summation of the existing equipment (Chapter 2, Table 2.6.1) and the Proposed Action totals.

dewatering well pumps, heap leach solution pumps, and lighting.

3.6.6 Waste Disposal and Sanitary System

All sanitary waste would be disposed of in the existing, on-site, and state-approved sanitary leach field, as well as an additional proposed sanitary leach field for the South Pipeline mining and processing operations (see Section 2.6.6). All trash and refuse would be hauled to an approved Class III-waivered landfill facility. In addition, CGM would also deposit approximately 250 used haul truck tires per year in the waste rock dump. All refuse is handled in accordance with applicable federal, state, and county laws and regulations.

3.6.7 Chemical Storage and Hazardous Materials Management

3.6.7.1 Chemical Storage

All chemicals required to be transported, stored, and/or used for the Project would be transported, stored, and/or used as they are for the existing Pipeline and Cortez facilities (see Section 2.6.7.1). An additional chemical storage area would be created for the Project at the new heap leach facility. Table 3.6.2 identifies the chemicals and the annual consumption that would be utilized under the Proposed Action, as well as the total annual consumption within the Project Area.

3.6.7.2 Hazardous Materials Management

Transportation, handling, and storage of chemical reagents, hazardous and other wastes would be conducted in a similar manner to the Pipeline and Cortez facilities (see Section 2.6.7). The existing Spill Prevention, Control and Countermeasure Plan (SPCCP) and Hazardous Material Spill and Emergency Response Plan would be amended to incorporate the new Project facilities and operations. Operations of the Proposed Action would not affect the Large Quantity Generator status now maintained by CGM.

3.6.8 Roads and Haul Roads

The ROW (N-43670) for a portion of the Gold Acres Haul Road from the junction with Lander County Route 225 to Gold Acres would be abandoned and replaced with temporary mine roads. An existing portion of the Cortez Mine Road (N-60542) would be rerouted to the east, around the tailings facility expansion, to connect with State Route (SR) 306. The new portion of the road would be approximately 10,500 feet in length and disturb approximately 37 acres. It would not be reclaimed upon completion of the

Table 3.6.2: List of Chemicals and Storage Amounts Under the Proposed Action and the Resulting Total On-site in the Project Area

Substance	Annual Usage[a,b] (lbs) Proposed Action	Annual Usage[a,b] (lbs) Total[c]
Sodium Cyanide	760,500	2,310,000
Lime	11,591,400	18,100,000
Hydrochloric Acid	0	927,500
Sodium Hydroxide	57,200	400,000
Flocculant[d]	324,200	660,000
Descalent	13,000	360,000
Gasoline	0	650,000
Diesel Fuel	0	30,500,000
Ferris Sulfate	0	2,640,000
Ammonium Nitrate	0	15,600,000

[a] Quantities do not include Cortez CFB roaster, mill and tailings facility chemical usage.

[b] The following hazardous materials and substances may be transported, stored, and used at the plant site in appreciable quantities, but less than the TPQ designated by SARA Title II for emergency planning: acetone; ammonium hydroxide; calcium hypochlorite; ethyl alcohol; freon; isopropyl alcohol; litharge (lead oxide); nitric acid; petroleum solvents; sodium hypochlorite; soda ash; and sulfuric acid. Sodium hypochlorite, hydrogen peroxide, and sulphuric acid are used as neutralizers and are kept on-site for emergencies. Small quantities of hazardous materials not included in this list may be used as laboratory reagents, paints, office products, and maintenance products.

[c] The Project Area total is a summation of the existing amount of chemical storage (Chapter 2, Table 2.6.2) and the Proposed Action totals.

[d] Flocculants used include Thatchler Polymer T-Floc, A-830, Nalco Nuclear 9708, and DULV Flocculant D8D.

Project, but would remain open for public use and access. Other haul roads would be constructed as necessary to connect the Project with the existing haul road system (see Section 2.6.8). New haul roads would be constructed to a width that would safely accommodate up to 310-ton haul trucks. A safety berm consistent with MSHA standards would be constructed on the outside edges of all haul roads. Appropriate drainage structures would be built. A small network of service vehicle access roads would be developed to monitor highwall slopes and provide access to the Project dewatering and infiltration system, the heap leach facility, tailings impoundments, and other portions of the Project Area.

3.6.9 Ditches and Surface Flows

The areas surrounding the Project contain numerous drainage channels that contain water only during times of intense precipitation and snow melt. Existing engineered stormwater diversion structures are constructed to divert stormwater around the Pipeline facilities, and additional structures will be designed and constructed to divert runoff away from the new proposed heap leach facility. Naturally occurring drainage courses would be utilized as much as possible to reroute runoff. South Pipeline facilities would be added to the existing CGM Stormwater Permit (see Section 2.6).

3.6.10 Gravel Pit

Operations at the gravel pit within the Project Area would continue; however, surface disturbance associated with these activities could be expanded to a maximum of 100 acres. Disturbed areas would be recontoured and seeded such that no more than five acres of disturbance are unrecontoured at any given time.

3.6.11 Fencing

Certain Project facilities located within the Project Area would be fenced, including any areas of cyanide use (see Figures 3.1.1 and 3.1.2).

3.6.12 Health and Human Safety

Project safety, security, and fire protection measures would be identical to that of the existing Pipeline operations (see Section 2.6.11).

3.7 Right-of-Way

A ROW would be required for the conveyance of water across public land and onto private land owned by CGM (Figure 3.7.1). The existing system of open channels and pipelines would serve the dual purpose of delivering dewatering water to infiltration sites and to CGM's Dean Ranch and other CGM-owned private parcels (e.g. Frome parcel, Filippini parcel, McCoy parcel). The ROW grant for conveying water across public land onto private land owned by CGM is located in portions of Sections 14, 15, 21, 22, 27, 28, 32, and 33 T28N R47E (Figure 3.1.1). None of the water diverted from the mine dewatering system to private land would be discharged to public land.

3.8 Exploration

Exploration activities would be conducted within the Project Area as part of the Proposed Action to identify and delineate satellite deposits. Drilling could also be conducted to confirm the grade of ore deposits or confirm that an area contains no economic gold ("condemn" an area). These activities would consist of surface geologic surveys, access road grading or construction, and exploration or condemnation hole drilling programs. Surface disturbance associated with exploration activities within the Project Area, but outside of approved disturbance areas, would be 50 acres. This acreage is in addition to the 48 acres currently permitted under the Pipeline Plan of Operations (N64-93-001P (96-1A)). However, given that this surface disturbance would be subject to concurrent reclamation, a maximum of 98 acres would be unreclaimed at any one time. Exploration activities would also occur within the areas of approved disturbance.

3.9 Reclamation

CGM would conduct reclamation activities in accordance with BLM surface management regulations 43 CFR 3809 1-3(d) and State of Nevada regulations NAC 519A. Areas of disturbance associated with the Project to be reclaimed consist of the South Pipeline waste rock dump, the new heap leach facility, the stockpile areas, haul and access roads, and other ancillary facilities associated with the Proposed Action. Reclamation of those facilities are approved under the Pipeline Plan of Operations, the Crescent Pit Plan of Operations, and the Gold Acres Plan of Operations documents and their associated plans of operations. The Project is an amendment to the Pipeline Plan of Operations (CGM 1992).

3.9.1 Reclamation Goals

The construction, maintenance, and reclamation phases of the Project have been designed to prevent covered under separate environmental unnecessary and undue degradation of the lands affected by CGM throughout the life of the Project. The objectives of the reclamation plan include minimizing or eliminating public safety hazards, stabilizing disturbed areas, and providing a post-mining surface condition that would be consistent with long-term land uses. The primary long-term land uses are expected to be wildlife habitat, livestock grazing, and possible future mining-related activity.

With the exception of the South Pipeline open pit, which would be constructed in its final configuration, reclamation activities would consist of regrading, topsoiling, and revegetating disturbed areas. The heap leach pad will be neutralized before regrading, topsoiling, and revegetation. Other reclamation would include removal of the pipes for transporting infiltration waters and pregnant/barren solutions, possibly regrading the South Pipeline pit wall, and installing safety features around the South Pipeline open pit.

Detailed reclamation activities for individual Project components are included in the POO (CGM 1996). A summary of the reclamation plan is provided below.

3.9.2 Reclamation Schedule

Based on current reserves and projected production rates, the Project would extend operations at the Pipeline mine for approximately eight additional years. The reclamation schedule is based on the reserves, production, and surface disturbance outlined in the POO. The schedule would change if reserves are increased or if economic conditions change.

Seeding activities would be timed to take advantage of winter and spring precipitation and coordinated with other reclamation activities. In general, earthwork and drainage control would be completed in summer or early fall. Seedbed preparation would be performed in

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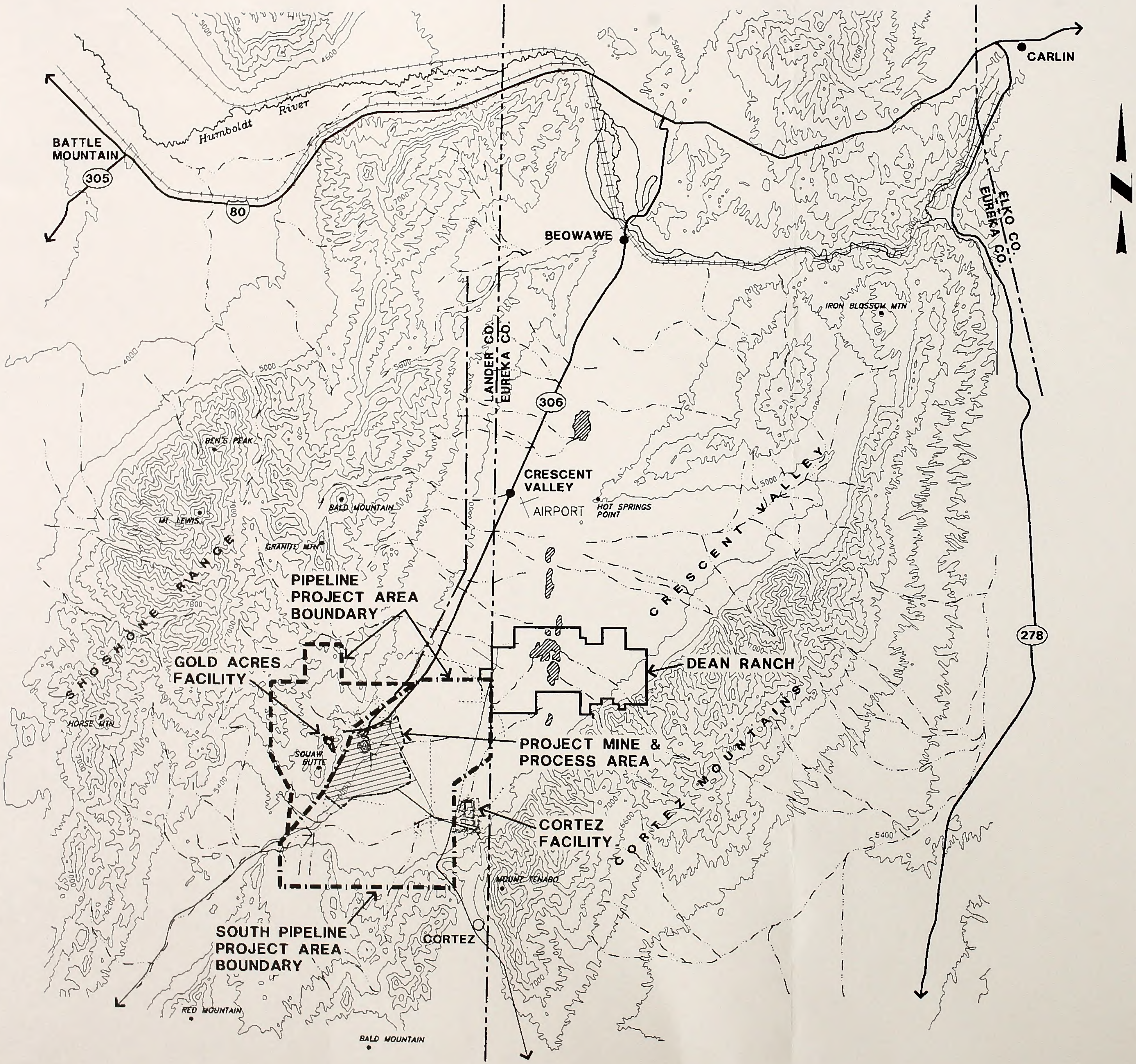
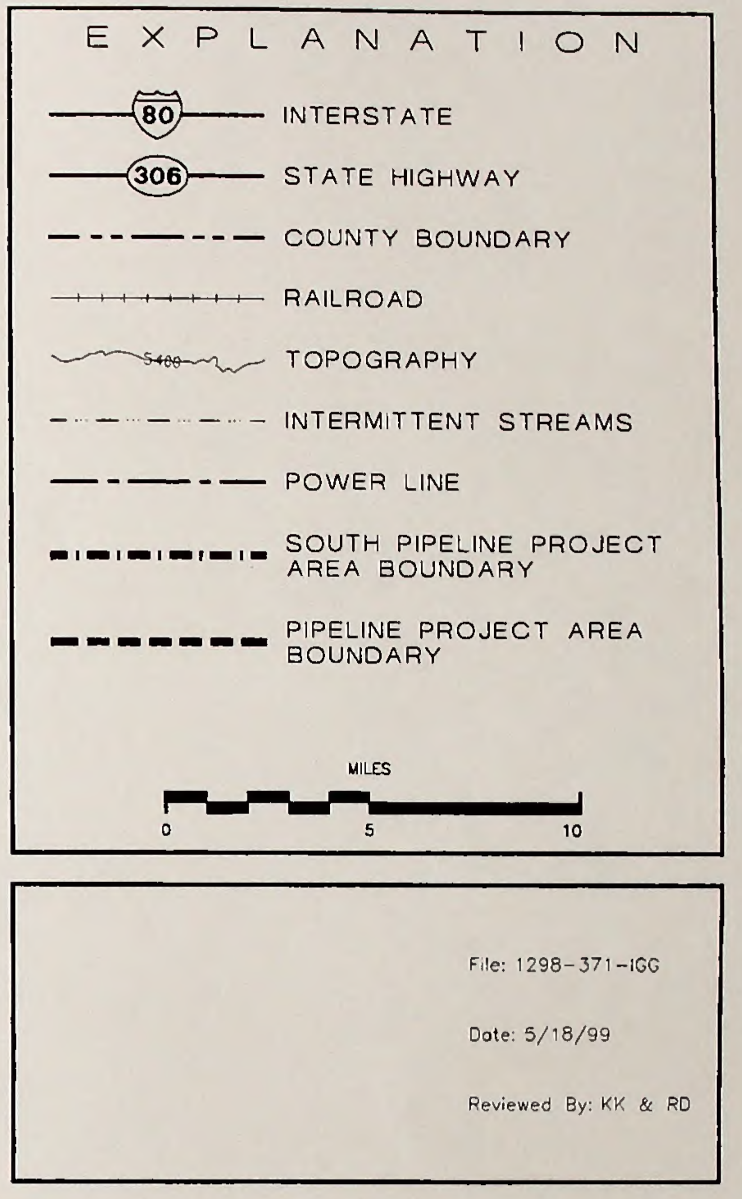




SOUTH PIPELINE AND PIPELINE PROJECT AREA BOUNDARIES AND DEAN RANCH LOCATION

Figure 3.7.1

the fall, either concurrent with or immediately prior to seeding. Seeding would be performed in mid- to late-fall. Some seeding may be performed in early spring.

Some of the Project facilities or portions of the facilities would be decommissioned prior to final mine closure and reclaimed concurrently with the active mine operations. Concurrent reclamation would take place on inactive portions of the waste rock dump as soon as practical and safe. Areas disturbed by soil/growth media stockpiles would be reclaimed after complete use of the piles.

3.9.3 Facilities Closure/Dismantling

3.9.3.1 Heap Leach Facility

The spent heap leach piles would be rinsed to neutralize residual cyanide, reshaped, and revegetated. Details of heap neutralization and closure would be developed two years prior to Project closure pursuant to the requirements of NAC 445A.446 and NAC 445A.447. The reclamation goal would be for heap rinsate to meet the NDEP standards found in NAC 445A.430.

The proposed detoxification procedure consists of an initial rest period followed by a freshwater rinse. Rinsing would continue until the regulatory closure standards are met. If the standard could not be met after a reasonable amount of rinsing, the water volume in circulation would be reduced by evaporation, and the heap would be allowed to rest again for a few months. Rinsing with freshwater would be reinitiated after the second rest period. If NDEP standards could again not be met, alternate detoxification procedures consistent with NAC 445A would be discussed with the NDEP and the BLM.

Once NDEP standards for the spent ore have been met, the top of the heap would be regraded to round the edges and inhibit ponding. The slopes of the heap leach pad would be regraded to approximately 2.5H:1V. Perimeter ditches would be backfilled during heap regrading and the solution piping removed. Following regrading, approximately 12 inches of growth medium would be spread over the surface of the heap leach facility. The heap leach facility would then be seeded with a BLM-approved seed mixture.

Following rinsing, the residual heap leach rinse water would be evaporated in the lined ponds. Any sediment which may have accumulated in the ponds would be characterized in accordance with NDEP regulations and guidelines. Depending on the sediment's characteristics, it would either be buried in place, removed and placed on the heaps, placed in the Pipeline tailings impoundment, or removed and placed in an approved landfill.

Pond liners would either be removed and disposed of in an approved landfill, or removed from the sides of the ponds and folded into the pond bottoms. The ponds would then be backfilled with alluvium and regraded to prevent the ponding of water and to blend with the surrounding topography.

Diversion structures would route runoff from upgradient sources around the leach facility. The structures would be maintained until completion of heap reclamation. Monitoring wells around the leach facility would be maintained until CGM is released of this requirement by the NDEP. Monitoring wells would then be closed in accordance with the requirements of the State Engineer (NAC 534.425 through 534.428).

3.9.3.2 Tailings Facility Closure

The expanded portion of the tailings facility would be reclaimed using the same reclamation procedures outlined in the Pipeline reclamation plan. Tailings facility closure procedures were previously approved for the Pipeline project.

Decommissioning of the tailings cells would be in accordance with NDEP regulations and the previously approved closure procedures for the Pipeline project. The dried tailings surfaces and the remaining embankment freeboard would be graded such that the tailings facility would be incapable of storing or impounding fluids. Following regrading, all areas which had not been concurrently reclaimed would be covered with growth media and revegetated consistent with the approved Reclamation Plan.

The Pipeline tailings facility is located on a relatively flat pediment and as a result was constructed with a four-sided embankment. The regrading plan is designed such that the final configuration would meet the following additional criteria:

- Create a stable surface;
- Maximize runoff and minimize infiltration of direct precipitation;
- Ensure long-term containment of the very fine-grained tailings; and
- Create a surface capable of sustaining the desired post-mining land use.

To accomplish this, the impoundment would be sloped to drain evenly in all directions, rather than directed toward a single spillway, lessening the potential for long-term downcutting through the embankment.

Reclamation of the tailings facility would also include removal of all surface piping, structures, and equipment. All buried piping would be cut, plugged and buried in place after it has been rinsed to closure specifications.

3.9.3.3 Demolition

Prior to demolition, all non-process facilities and equipment would be inspected to determine the location, identities, and quantities of potential hazardous materials or wastes. The materials would be recycled to other CGM operations, if possible, or by recycling contractors. Materials that are not recycled would be disposed of according to federal and state regulations. Residues of cyanide or other toxic chemicals in equipment or on surfaces would be treated to applicable federal and state standards prior to demolition.

All mobile mining equipment would be removed from the site. Ancillary facilities and equipment would be dismantled and removed. Equipment with salvage value would be sold. All remaining scrap and demolition debris would either be disposed of off-site or in an approved landfill.

Foundations, walls and sumps would be pushed flat, broken up in place, and buried with rock and growth media to eliminate any safety hazards and allow the sites to be reclaimed. Concrete floors would be broken up and buried a minimum of 4 feet. Sumps or other voids would be backfilled and reclaimed.

3.9.4 Contouring and Shaping

3.9.4.1 Waste Rock Dump

A majority of the waste rock dumps would be reclaimed concurrently with mining. The waste rock dumps would be contoured and shaped to provide stable revegetated slopes and meet visual goals. Dump crests would be rounded and the angle of repose slopes would be pushed down to an average of 3:1, but would vary from 2:5 to 4:1 in order to provide variable-slope topography that would blend into the surrounding natural relief. The dump top would be shaped into irregular terrain to break up the flat surface topography. The irregular topography and random placement of large rocks on the tops and slopes would provide enhanced cover for wildlife, a more natural appearance, snow harvesting, and microclimates conducive to revegetation. Similarly, the footprint would be irregular.

A bench, 15 feet or wider, would remain at the top of the lowest lift which would reduce runoff flow velocities and potential erosion (Figure 3.9.1). It is not expected that any further sediment controls would be required; however, sediment traps or other Best Management Practices (BMPs) would be installed if necessary.

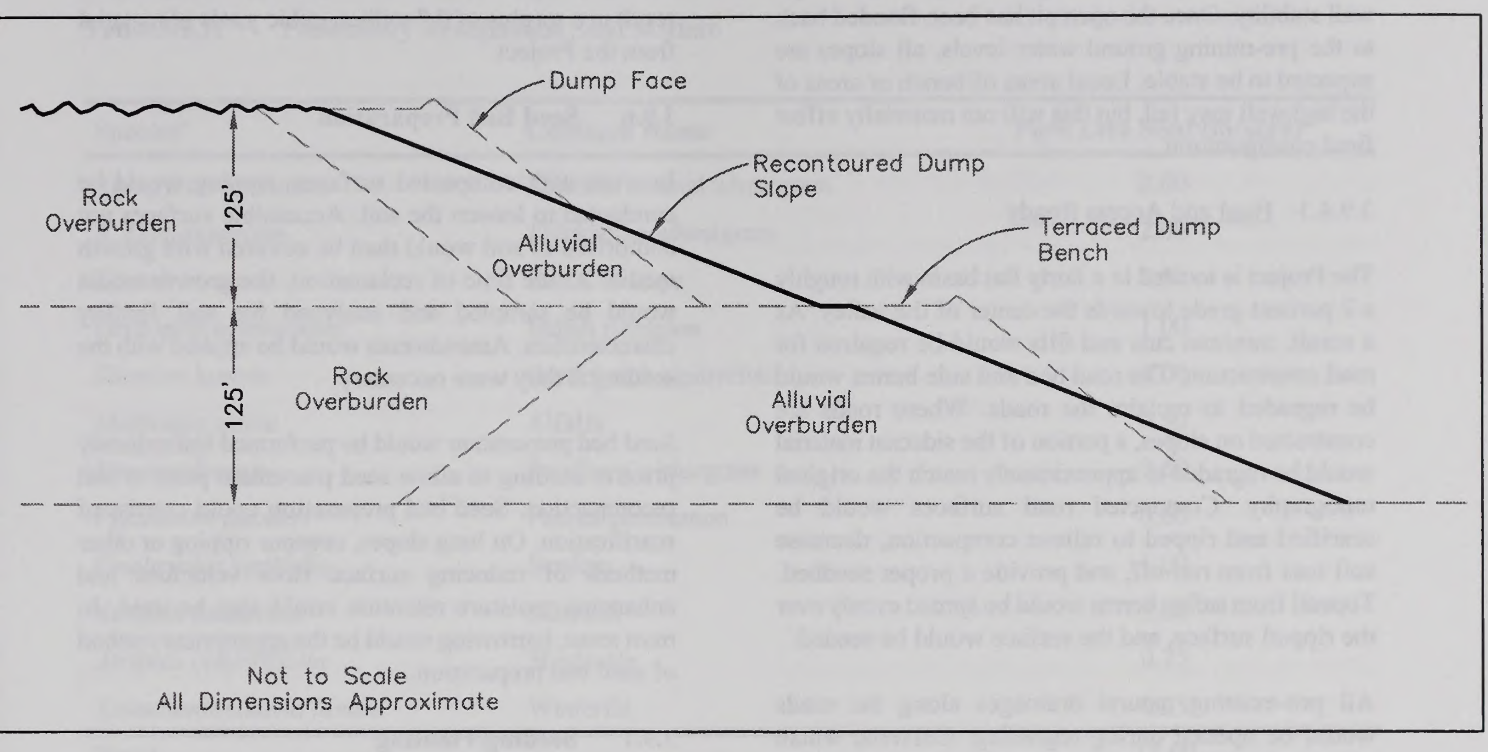
Following regrading, approximately 12 inches of growth media would be spread over the surface of the waste rock dumps if the waste rock material is not suitable for use as growth media. The dumps would then be seeded with a BLM-approved seed mixture.

A long-term stability analysis of the waste rock dumps was conducted, including seismic impacts. The analysis indicates that the proposed waste rock dump design would be stable under static and seismic conditions in its final reclaimed configuration.

3.9.4.2 Open Pit

Reclamation of the open pit would include construction of a physical perimeter barricade to prevent vehicular access, and deter livestock. Post-mining pit wall modifications to decrease slope angles are not proposed. The open pit design includes wall slopes ranging from 38 to 50 degrees depending on rock type, geotechnical considerations, and mitigation for water quality. During mining, additional geotechnical and slope movement monitoring studies would be conducted to evaluate the safety of the open pit walls. Open pit dewatering would cease once mining was completed. Ground water would be allowed to enter and accumulate within the open pit, forming an artificial lake. Under the Partial Backfill Option, the pit lake would cover the backfill material, therefore no additional reclamation activities would be conducted. Active streams would not discharge into the open pit because of surface diversions.

Open pit walls under hydrostatic conditions (i.e., when submerged), would have the same factor of safety as completely drained slopes comprised of the same material. Pore pressure is balanced by the pressure of the column of water in the pit lake (Golder and Associates 1992). Therefore, pit wall behavior after flooding should be similar to the behavior of dewatered pit walls during open pit development. During open pit filling, however, the pressure is not equal, and slope stability would depend on material types and inflow rates. In the relatively competent bedrock, ground water



EXPLANATION

— — — CONSTRUCTED TOPOGRAPHY

——— RECLAIMED TOPOGRAPHY

Dumps will be built so the outside face is made up of alluvium where possible. If the dump face is not made up of alluvium, a growth medium will be placed on the face after recontouring.

Drawing by Cartez Gold Mines, 1996.

File: 1298-391-IGG
Date: 5/18/99
Reviewed By: KK & RD

TYPICAL RECLAIMED DUMP SLOPE CONFIGURATION

Figure 3.9.1

SOUTH PIPELINE PROJECT EIS

inflow is not expected to significantly influence pit wall stability. Once the open pit has been flooded back to the pre-mining ground water levels, all slopes are expected to be stable. Local areas of bench or areas of the highwall may fail, but this will not materially affect final configuration.

3.9.4.3 Haul and Access Roads

The Project is located in a fairly flat basin with roughly a 2 percent grade towards the center of the valley. As a result, minimal cuts and fills would be required for road construction. The road bed and side berms would be regraded to reclaim the roads. Where roads are constructed on slopes, a portion of the sidecast material would be regraded to approximately match the original topography. Compacted road surfaces would be scarified and ripped to relieve compaction, decrease soil loss from run-off, and provide a proper seedbed. Topsoil from safety berms would be spread evenly over the ripped surface, and the surface would be seeded.

All pre-existing natural drainages along the roads would be opened during regrading. Culverts, where present, would be removed, and the channels would be restored to the natural flow capacity. Dikes and ditches whose usage was no longer required would be regraded. Where necessary, runoff from the reclaimed road surfaces would be controlled with waterbars and turnouts to reduce erosion.

3.9.5 Soil Salvage and Stockpiles

Sufficient soil material would be salvaged from proposed areas of disturbance to fulfill reclamation needs. Material would be placed in clearly marked stockpiles in locations that would be out of the way of future development and where hauling and placement costs during reclamation would be minimized. A determination would be made whether topsoil or subsurface alluvial material would be the higher quality growth media available at the site and the most beneficial for salvage.

Stockpiles would be constructed with stable side slopes and surface run-on diversions where necessary. BMPs such as interim seeding, silt fences, and staked straw bales would be used to contain sediment liberated by direct precipitation. Complete growth media stockpiles would be seeded with a BLM-approved interim seed mix to protect the surface from erosion.

A preliminary soil balance for the Project indicates 1. 7 million cubic yards of material could be salvaged. Approximately 1 million cubic yards of material would be required to cover to a depth of 12 inches the Project facilities targeted for reclamation. The amount would result in a surplus of 0.7 million cubic yards of material from the Project.

3.9.6 Seed Bed Preparation

In areas with compacted surfaces, ripping would be conducted to loosen the soil. Accessible surfaces not comprised of soil would then be covered with growth media. At the time of reclamation, the growth media would be sampled and analyzed for soil fertility characteristics. Amendments would be applied with the seeding if they were necessary.

Seed bed preparation would be performed immediately prior to seeding to allow seed placement prior to soil recompaction. Seed bed preparation could consist of scarification. On long slopes, contour ripping or other methods of reducing surface flow velocities and enhancing moisture retention could also be used. In most areas, harrowing would be the appropriate method of seed bed preparation.

3.9.7 Seeding/Planting

All reclaimed surfaces would be revegetated to control runoff, reduce erosion, provide forage for wildlife and livestock, and reduce visual impacts. Seed would be applied with either a rangeland drill, mechanical broadcaster and harrow, or hand seeder. The terrain and access of the reclaim areas would dictate the seeding method.

3.9.8 Seeding Mixtures and Rates

The primary goal of revegetation would be to provide for stabilization of the site and post-mining land use. Appropriate seed mixtures, approved by the BLM, would be used during reclamation to provide stability for post-mining land use. The mixtures would consist of species that can be sustained in the environment of central Nevada, have been proven species for revegetation, and/or would consist of species found in the plant communities present prior to Project disturbance (Table 3.9.1). The seed mixtures could be modified based on the results of concurrent reclamation programs and revegetation test plots.

3.9.9 Fencing

Boundary fences of three- or four-strand wire, built to BLM standard specifications, would be erected around the Project disturbed areas to exclude livestock grazing. Fences would be maintained by CGM until vegetation was reestablished and approved by the BLM.

Table 3.9.1: Preliminary Revegetation Seed Mixture

Species[a]	Common Name	Pure Live Seed (lb/acre)[b]
Agropyron cristatum	Ephraim crested wheatgrass	2.00
A. Dasystachyum	Thickspike wheatgrass	2.00
Elymus cinereus	Basin Wildrye	2.00
Oryzopsis hymenoides	Indian ricegrass	1.00
Sitanion hystrix	Bottlebrush squirreltail	1.00
Medicago sativa	Alfalfa	0.50
Poa sandbergii	Sandberg's bluegrass	0.50
Penstemon palmeri	Palmer penstemon	0.50
Onobrychis viciifolia	Sanfoin	1.00
Atriplex canescens	Saltbush	2.00
Atriplex confertifolia	Shadscale	0.25
Krascheninnikovia lanata	Winterfat	0.25
Total		13.00

[a] Seed mixtures may change from time to time during concurrent and final reclamation. The changes would be based on targeting specific soil/disturbance types and experience gained during concurrent reclamation during the life of the Project, on test plot results, and changes in agency recommendations.

[b] Application rates would be doubled for broadcast seeding.

3.9.10 Erosion Control

BMPs would be used to limit erosion and reduce sediment in precipitation runoff from the Project facilities and disturbed areas. BMPs include diversion ditches to route stormwater, and erosion control devices such as sediment traps, hay bales, filter fences, and rock and gravel cover.

3.10 Monitoring and Reclamation Success Evaluation

Post-reclamation monitoring would begin on any reclaimed area following completion of the reclamation work for the area. Post-reclamation monitoring would extend until the reclamation of the site or individual component has been accepted by both the BLM and NDEP. For bonding purposes, a three-year monitoring period would be assumed following completion of reclamation on any site component.

3.10.1 Erosion Controls

All sediment and erosion control measures would be inspected periodically during the life of the Project. Maintenance would occur on a regular basis, as needed.

3.10.2 Revegetation Success Monitoring

Revegetation monitoring would be conducted for a minimum of three years following implementation of revegetation activities, until revegetation success has been achieved. Revegetation monitoring would occur based on seasonal growth patterns, precipitation, and weather conditions. The success standards established in the "Nevada Guidelines for Successful Revegetation for the Nevada Division of Environmental Protection, the Bureau of Land Management, and the U.S.D.A. Forest Service" would be applied to determine revegetation success. Specifically, the release criteria would be to "achieve as close to 100 percent of the perennial plant cover of selected comparison areas as possible. The comparison areas would be selected from representative plant communities adjacent to the mine site, test plots, demonstration areas, or as appropriate,

representative ecological or range site descriptions." The determination of successful revegetation would also consider the species composition, self-sustainability, and physical stability of the reclaimed community.

3.11 Concurrent Reclamation

Concurrent reclamation would begin upon completion of activities at each component of disturbance. Areas such as cut and fill embankments and growth media stockpiles would be seeded following construction. Areas disturbed by soil/growth media stockpiles would be reclaimed after complete use of the piles.

Concurrent reclamation would take place on inactive portions of the waste rock dump as soon as practical and safe to accelerate revegetation.

3.12 Environmental Protection Measures

CGM would commit to the same environmental protection measures outlined in the Pipeline project FEIS (BLM 1996a; pages 2-35 through 2-40). In addition, CGM would commit to the following measures to prevent unnecessary and undue degradation during mine design, construction, operation, and closure. These measures are derived from the general requirements established in BLM's Surface Management Regulations at 43 CFR 3809 and NDEP mining, reclamation, water, and air quality regulations:

- All regulated components of the facility would be designed and constructed to meet or exceed BLM/NDEP/Nevada Division of Wildlife (NDOW)/Nevada Division of Water Resources (NDWR) design criteria. Waste rock dumps and stockpiles that do not require engineered containment would be evaluated for their potential to release pollutants and would be monitored routinely;
- The heap leach facility would be operated in accordance with approved fluid management, emergency response and monitoring plans established by NDEP permit conditions and the BLM Cyanide Management Plan;
- All mineral exploration and development drill holes, monitoring and observation wells, and production dewatering wells subject to Nevada regulations would be properly abandoned to prevent contamination of water resources;
- All regulated wastes would be managed according to relevant regulations;
- Surface disturbance would be minimized while optimizing the recovery of mineral resources;
- Fugitive dust emissions from disturbed and exposed surfaces would be minimized;
- Surface water drainage control would be accomplished by diverting stormwater, isolating facility runoff, and minimizing erosion;
- Noxious weed control would be accomplished through implementation of the monitoring and control plan that is a component of the Pipeline POO (CGM 1992).
- Where suitable as a growth media, surficial soils, and alluvial material with favorable characteristics would be managed as a growth medium resource and removed, stockpiled and used during reclamation; and
- A reclamation plan and bond cost estimate would be implemented which addresses earthwork, revegetation and stabilization, detoxification and disposal, and monitoring operations necessary to satisfactorily reclaim the proposed disturbance. The disturbance includes roads, process ponds, heaps, waste rock dumps, buildings, and equipment as covered in the POO (CGM 1996).

3.13 Financial Assurance

CGM has prepared a detailed estimate for the reclamation work included in the Proposed Action. The cost estimate reflects the potential contractor costs for each of the components, as well as supervisory and administration costs for the BLM and its engineering contractor. The total amount of the bond cost estimate is approximately $15,336,000 (CGM 1996), representing a $10,204,000 increase over the Pipeline project financial assurance. In addition, CGM has established a long-term contingency fund of $1,250,000 to provide for long-term monitoring and corrective action, if required, for pit lake water quality and/or dewatering-related impacts (BLM 1996a).

The surety would be posted by CGM in a form acceptable to the NDEP and BLM and would be held by the BLM. The BLM and NDEP would make final determination of the cost estimate for reclamation.

3.14 Alternatives to the Proposed Action

National Environmental Policy Act (NEPA) (42 USC 4322(E)) requires that an Environmental Impact Statement (EIS) "... study, develop, and describe appropriate alternatives to recommend courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources." Chapter V, Section B.1.e.(2) of the BLM NEPA Handbook directs that "... reasonable alternatives to this proposed action - including the no action alternative which reflects continuation of the current management practices or denial of the action - must be defined." This section of the BLM NEPA Handbook continues by stating that "Each alternative, except the no action alternative, should represent an alternative means of satisfying the identified purpose and need and of resolving issues. The rationale for considering but not selecting for further analysis certain suggested alternatives must be documented, especially those suggested by the public or other agencies." EIS preparers are directed to "consult program-specific guidance for additional requirements on alternatives."

The inclusion of alternatives in the Project EIS will be based on specific criteria: (a) public or agency concern; (b) technical or economic feasibility; (c) the potential to reduce an environmental impact of the Proposed Action; and (d) the ability to meet the purpose and need of the Action. The Scoping Document organized comments received during public scoping by resource type and Project issues, and included recommendations on alternatives to be analyzed in the EIS. The Project Scoping Document is on file and available for review at the BLM Battle Mountain Field Office. The alternatives to the Proposed Action, as currently defined, identified by the public during scoping include:

- A smaller project;
- Injection of dewatering water;
- Partial open pit backfilling;
- Complete open pit backfilling; and
- Infiltration upgradient of the open pit.

Of the alternatives identified during scoping, the injection of dewatering water into alluvium has been identified as an option under the Proposed Action. The environmental consequences of the options will be analyzed under the environmental consequences sections of the Proposed Action of the EIS (Chapter 4).

This section of the EIS discusses alternatives to the Proposed Action and identifies which alternatives are to be analyzed in the remainder of the EIS along with the Proposed Action and which alternatives are evaluated in this section of the EIS and eliminated from detailed consideration in the remainder of the EIS. Two alternatives have been identified for analysis in the EIS along with the Proposed Action - the No Action Alternative and the Pipeline Backfill Alternative. The Pipeline Backfill Alternative is the same as the partial backfill alternative identified by the public during scoping. A number of other alternatives were evaluated, including those identified by the public during scoping, and eliminated from detailed consideration. The alternatives are discussed in the following section.

3.14.1 No Action Alternative

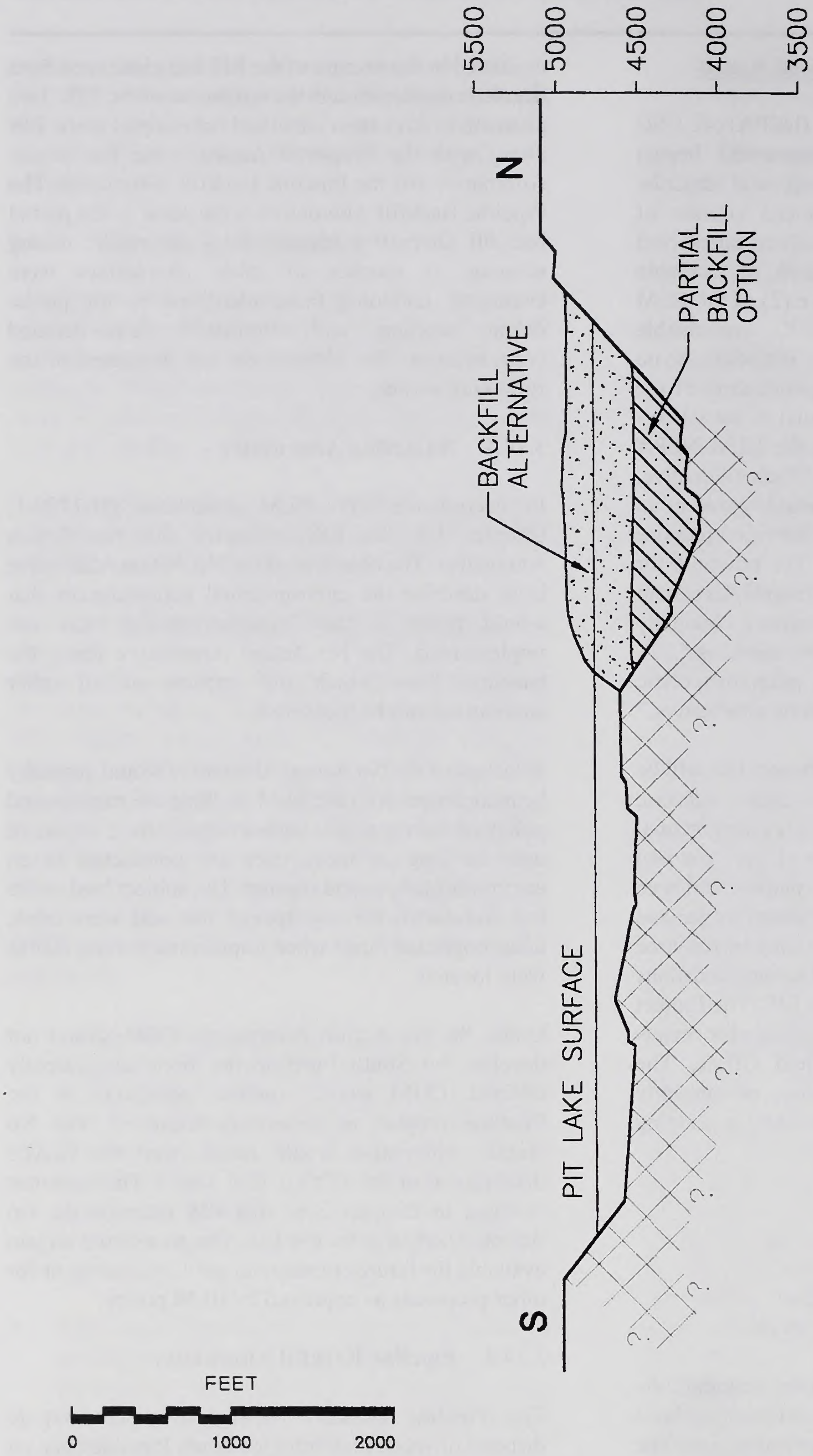
In accordance with BLM guidelines (H-1790-1, Chapter V), the EIS evaluates the No Action Alternative. The objective of the No Action Alternative is to describe the environmental consequences that would result if the Proposed Action was not implemented. The No Action Alternative forms the baseline from which the impacts of all other alternatives can be measured.

Selection of the No Action Alternative would generally be inconsistent with the BLM multiple use mission and policy of making public lands available for a variety of uses as long as these uses are conducted in an environmentally sound manner. The subject lands were not withdrawn for any special use and were open, unappropriated lands when unpatented mining claims were located.

Under the No Action Alternative, CGM would not develop the South Pipeline ore body as presently defined. CGM would continue operations at the Pipeline project, as previously approved. The No Action Alternative would result from the BLM's disapproval of the POO (CGM 1996). The activities outlined in Chapter 2 of this EIS describe the No Action Alternative for this EIS. The area would remain available for future commercial gold processing or for other proposals as approved by BLM policy.

3.14.2 Pipeline Backfill Alternative

The Pipeline Backfill Alternative would require disposal of waste rock from the South Pipeline open pit into the Pipeline open pit rather than the South Pipeline waste rock dump (Figure 3.14.1). The Pipeline Backfill Alternative would be essentially identical to the Proposed Action, except as follows:



EXPLANATION

ZONE OF REASONABLY FORSEEABLE MINERALIZATION

File: 1298-3131-IGG
Date: 5/18/99
Reviewed By: KK & RD

CROSS SECTION OF PIPELINE/SOUTH PIPELINE OPEN PITS

Figure 3.14.1

SOUTH PIPELINE PROJECT EIS

- The mining sequence would be revised so that the Pipeline open pit would be completed first, followed by mining of the northern segments of the South Pipeline open pit, followed by the remainder of the South Pipeline open pit;

- Backfilling would occur either by end dumping material over the edge of the Pipeline open pit rim or dumping waste rock within the open pit. The dumping pattern would depend on the location of haul roads in the open pit and the location of mining activities occurring at the same time in the South Pipeline portion of the open pit; and

- A portion of the waste rock from the South Pipeline open pit would be hauled via haul trucks to the Pipeline open pit for backfilling, and a portion of the 1,096-acre South Pipeline waste rock dump would not be constructed. Of the 450 million tons of waste rock mined from the South Pipeline open pit, approximately 250 million tons would be required to backfill the Pipeline open pit. Due to the fact that the Pipeline and South Pipeline open pits would be different portions of the same open pit, backfilling could only occur to the extent that normal mining procedures in the South Pipeline portion of the pit would not be encumbered by the presence of waste rock. Following backfilling, and completion of mining of the South Pipeline portion of the pit, the Pipeline portion of the former open pit would be reclaimed.

Implementation of the Pipeline Backfill Alternative would result in surface area disturbance of approximately 3,841 acres, as opposed to 4,450 acres from the Proposed Action. Estimates of the surface area disturbed by the Pipeline Backfill Alternative are presented in Table 3.14.1.

3.14.3 BLM Preferred Alternative

Chapter V, Section B.2.b. of the BLM NEPA Handbook directs that "The manager responsible for preparing the EIS should select the BLM's preferred alternative. ... For externally initiated proposals, ... the BLM selects its preferred alternative unless another law prohibits such an expression. ... The selection of the preferred alternative should be based on the environmental analysis as well as consideration of other factors which influence the decision or are required under another statutory authority."

Thus, the BLM Preferred Alternative is the alternative that best fulfills the agency's statutory mission and responsibilities, giving consideration to economic, environmental, technical and other factors. BLM has determined that the preferred alternative is the Proposed Action as outlined in Chapter 3 with the inclusion of the identified mitigation measures to the Proposed Action as specified in Chapter 4.

3.14.4 Alternatives Eliminated from Detailed Consideration

As outlined in the Project Scoping Document, several alternatives were identified for consideration in this EIS. The Project Scoping Document is on file and available for review at the BLM Battle Mountain Field Office. The following is a discussion of those alternatives identified through scoping, which include alternatives identified by the public that have been eliminated from detailed consideration in this EIS. A number of potential alternatives to the Proposed Action were previously identified as alternatives to the Pipeline project and eliminated from further detailed consideration (BLM 1996a; pages 2-40 through 2-47). The analysis of these alternatives that was presented in the Pipeline FEIS has been revised and is considered sufficient since the Project is adjacent to and an expansion of the existing Pipeline project and the scope of the Project is similar to the Pipeline project.

3.14.4.1 Alternatives for Discharge of the Pumped Water

Three alternatives to the Proposed Action for the discharge of pumped water were identified in the Project Scoping Document: bedrock injection, discharge to the Humboldt River, and infiltration upgradient of the open pit. Bedrock injection and agricultural development, were previously considered in the Pipeline project FEIS. Alternative 1 (bedrock injection)was eliminated from detailed analysis in the Pipeline project FEIS (BLM 1996a; pages 2-43 through 2-45). The reasons for elimination from further consideration are summarized below, based on the *Preliminary Characterization of Ground Water Conditions and Dewatering Pre-Feasibility* (WMC 1992a), and *Characterization of Baseline Conditions for the South Pipeline Project* (Geomega 1998b). Alternatives 2 and 3 were identified in the Project Scoping Document and are also addressed below.

3.14.4.1.1 Alternative 1 - Bedrock Injection

The injection of water from dewatering operations potentially could occur in either the Quaternary Age basin-fill alluvium or the Paleozoic Age bedrock. As part of the Proposed Action, CGM has planned an option to inject water from the dewatering operations into the Quaternary Age basin-fill alluvium. See

Table 3.14.1: Summary of Pipeline Open Pit Backfill Alternative Surface Disturbance

Mine Facility Component		Disturbed Acres: Approved	Disturbed Acres: Pipeline Backfill Alternative	Disturbed Acres: Combined Total
MINE AND PROCESS AREA				
Pits	Crescent open pit[a]	40		40
	Pipeline Pit/Haul Roads	276		276
	South Pipeline open pit		530	530
	South Pipeline Adjustment Zone		75	75
	Subtotal:	**316**	**605**	**921**
Ore and Process Facilities	Pipeline Plant Site	56		56
	Plant Expansion / Ore Stockpile	19	58	77
	Pipeline/South Pipeline Tailings	444	434	878
	Pipeline Heap Leach Expansion		54	54
	Pipeline/South Pipeline Heap Leach Facility		758	758
	Gold Acres Heap Leach	49		49
	Subtotal:	**568**	**1,304**	**1,872**
Waste Rock Dumps	Crescent Waste Rock Dump[b]	50		50
	Pipeline Waste Rock Dump	667		667
	South Pipeline Waste Rock Dump		487	487
	Subtotal:	**717**	**487**	**1,204**
Support Facilities	Soil Stockpiles	18		18
	Plant Area Roads	31		31
	Plant Access Corridor		56	56
	Gravel Pit	100		100
	Ancillary Facilities[c]	362	1,302	1,664
	County Road Construction/Cortez Access Road Relocations	29	37	66
	Drainage Diversions	21		21
	Subtotal:	**561**	**1,395**	**1,956**
	Total Mine and Process Area:	**2,162**	**3,791**	**5,953**
OTHER AREAS OF DISTURBANCE WITHIN THE PROJECT AREA				
Exploration Activities		48	50	98
Mine Water Infiltration Basins/Pipe Lines/Ditches		956	0	956
	Total Ancillary Area:	**1,004**	**50**	**1,054**
TOTAL OPEN PIT BACKFILL ALTERNATIVE:		**3,166**	**3,841**	**7,007**

[a] Approved disturbance is 54 acres; the additional 14 acres included under Ancillary Facilities.

[b] Approved disturbance is 114 acres; the additional 64 acres included under Ancillary Facilities.

[c] Ancillary Facilities area identified on Figure 3.1.2 covers 1,664 acres, which includes 362 acres of approved, but not otherwise identified, disturbance.

Section 3.3.2 for a discussion of this option. This option is also fully analyzed in Chapter 4 of this EIS. Therefore, an alternative addressing the injection of water into the Quaternary Age basin-fill alluvium has not been further considered.

The injection of water into the Paleozoic Age bedrock is an alternative that was eliminated from further consideration for the following reasons:

- Not effective in reducing the impact (drawdown) on the Basin Fill aquifer (alluvium);
- Relatively high reclamation/abandonment costs;
- May require the operation of a remote power source for backwashing;
- Water from backwash may require secondary discharge; and
- More energy intensive to operate.

3.14.4.1.2 Alternative 2- Discharge to the Humboldt River

This alternative would convey the pumped water, via a ditch or pipeline, approximately 25 miles and discharge the water into the Humboldt River. This alternative was eliminated from further consideration for the following reasons:

- Discharge to the Humboldt River would remove the water from the Crescent Valley Ground Water Basin, resulting in 100 percent consumption of the water relative to the ground water basin water balance, which is not the State Engineer's primary option for management of the State's water;
- Legal aspects of crossing lands with different owners; and
- Possible long-term (post-mining) implications of having to supply water to secondary users because of loss of water from the basin.

3.14.4.1.3 Alternative 3 - Infiltration Upgradient to Open Pit

Alternative 3 would infiltrate the pumped ground water from the dewatering operations southwest of the open pit in a surface hydrology upgradient location. Because of the limited area in the upgradient direction before the mountain range is encountered, the infiltration basins would be close to the open pit (less than 3 miles). Infiltration at a location so close to the open pit has the potential to decrease the recycle time of the water, from the dewatering wells to the infiltration basins and back to the dewatering wells. Thus, this alternative would increase the pumping requirements and costs. In addition, the ground water mound that would result from the Proposed Action, in the downgradient direction, would be reduced and possibly eliminated potentially causing a reversal in the ground water flow direction. A change in flow direction would eliminate the buffer between the dewatering operations and the downgradient users, and potentially increase impacts to down-gradient users. Therefore, this alternative has been eliminated from further consideration.

3.14.4.2 <u>Alternatives for Open Pit Backfilling</u>

Four alternatives to the Proposed Action for open pit backfilling were identified in the Project Scoping Document: backfill Horse Canyon open pit, backfill Cortez open pit, backfill Gold Acres open pit, and backfill South Pipeline open pit. Of these four alternatives, Alternatives 1, 2, and 3 (backfilling at Horse Canyon, Cortez, and Gold Acres, respectively) were considered and eliminated from detailed analysis in the Pipeline project FEIS (BLM 1996a; pages 2-46 and 2-47). A summary of these alternatives and the reasons for elimination from further consideration presented in the Pipeline project FEIS are given below. The fourth alternative, backfill the South Pipeline open pit, was indirectly addressed in the Pipeline project FEIS. The Pipeline project FEIS evaluated an alternative for the backfilling of the Pipeline open pit with Pipeline waste rock (BLM 1996a; pages 2-46 through 2-47) but eliminated it from detailed consideration. Backfilling the Pipeline open pit with Pipeline waste rock is similar to backfilling the South Pipeline open pit with South Pipeline waste rock. Alternative 4 is discussed below.

3.14.4.2.1 Alternative 1- Horse Canyon Backfill

The Horse Canyon open pit is situated approximately 24 miles from, and 4,000 feet in elevation above, the proposed South Pipeline open pit. An increase in fugitive dust air emissions would occur as a result of the additional haul distance in this alternative. A greater number of haul trucks would travel an additional 24 miles on the unpaved Horse Canyon Haul Road. Additionally, the haul from the Horse Canyon area to the proposed South Pipeline open pit is considerably greater than the haul distances from the South Pipeline waste rock dump to the South Pipeline open pit as described in the Proposed Action. The additional haul trucks and increased operating hours are anticipated to produce a net increase in combustion

emissions. The combustion of diesel fuel by the mobile mining equipment would increase emissions of particulate matter less than 10 microns in diameter (PM_{10}), volatile organic compounds (VOCs), nitrogen oxides (NO_X), sulfur oxides (SO_X) and carbon monoxide (CO) due to additional haul distance and extended operating hours.

The difficulty with in-pit disposal of waste rock is that a certain amount of mineralization would be left in the open pit as designed, and depending on economic factors, this material could be removed as ore in the future. The Horse Canyon open pit is designed around a specific minimal ore grade or "cut-off" based on current and projected economics and market conditions. If the economic basis for the pit design changes (i.e., the price of gold increases or production costs decrease), additional portions of the pit could be mined. This would extend the length of the operation and increase the utilization of the resource. Placing waste rock in the Horse Canyon open pit would limit the possibility of expanding the open pit in the future to remove additional ore.

Compared with the Proposed Action, the Horse Canyon backfill alternative would proportionally reduce the surface disturbance associated with the South Pipeline waste rock dump.

The alternative was eliminated from further consideration for the following reasons:

- Increased environmental impacts; and
- Minimized opportunity for future mining.

3.14.4.2.2 Alternative 2 - Cortez Backfill

Exploration drilling in and around the Cortez open pit has defined potential ore reserves, depending upon economics. Further drilling will be necessary to define the limits of mineralization. The backfilling alternative was eliminated from further consideration, due to potential of economic mineralization adjacent to the Cortez pit.

3.14.4.2.3 Alternative 3 - Gold Acres Backfill

The Gold Acres open pit is located primarily on patented claims approximately 1.5 miles from the proposed South Pipeline open pit. An increase in fugitive dust air emissions would occur as a result of the additional haul distance in this alternative. A greater number of haul trucks would travel an additional 1.5 miles on the unpaved Gold Acres Haul Road. Additionally, the haul road from the Gold Acres open pit to the proposed South Pipeline open pit is greater than the haul distances from the South Pipeline waste rock dump to the South Pipeline open pit as described in the Proposed Action. The anticipated number of additional haul trucks and increased operating hours would produce a net increase in combustion emissions. The combustion of diesel fuel by the mobile mining equipment would increase emissions of PM_{10}, VOCs, NO_X, SO_X and CO due to the additional haul distance and extended operating hours.

In addition, the backfilling of the Gold Acres open pit would result in covering approximately 300,000 ounces of additional reserves (BLM 1996a; page 2-47) that CGM plans to develop in the future. This would be inconsistent with the National Mineral Policy (Mining and Minerals Policy Act of 1970 (MMPA) [30 USC 21a] and Materials and Mineral Policy, Research and Development Act of 1980 [30 USC 1601]).

Compared with the Proposed Action, the Gold Acres backfill alternative would proportionally reduce the surface area disturbance associated with the South Pipeline waste rock dump. This alternative was eliminated from further consideration for the following reasons:

- Increased environmental impacts; and
- Minimized opportunity for future mining.

3.14.4.2.4 Alternative 4 - South Pipeline Backfill

Alternative 4 would backfill the proposed South Pipeline open pit with South Pipeline overburden and waste rock material. Based on the mine plan and pit configuration, backfilling could not begin until late into the Project life. Under this alternative, the same amount of surface disturbance would occur as under the Proposed Action because the backfill material would first be hauled to the expanded waste rock dumps so that the South Pipeline open pit could be mined. The material would then be hauled back from the expanded waste rock dumps to the open pit. Since the South Pipeline open pit would eventually encompass the Pipeline open pit, the volume of material required to fill the South Pipeline open pit (including the volume of the Pipeline open pit) would be greater than the volume of waste rock that would be mined under the Proposed Action. Therefore, backfilling the South Pipeline open pit with South Pipeline waste rock would not fill the open pit. As a result, an open pit would remain and the South Pipeline portion of the waste rock dump would be eliminated. In addition, the backfilling of the South Pipeline open pit would result in the covering of additional mineral resources that are currently not economic to develop. This scenario would be

inconsistent with the National Mineral Policy (MMPA [30 USC 21a] and Materials and Mineral Policy, Research, and Development Act of 1980 [30 USC 1601]).

This alternative was eliminated from further consideration for the following reasons:

- Some increases in environmental impacts as compared to the Proposed Action and limited ability in eliminating environmental impacts of the Proposed Action; and

- Minimized opportunity for future extraction of potential mineral resources.

3.14.4.3 Project Component Alternatives

Five alternatives to the Proposed Action for the location of Project components were identified in the Project Scoping Document; underground mining, reduced mining rate, alternative facility locations outside the Project Area, reduced Project, and alternative facility locations within the Project Area. Three of these five alternatives; underground mining (Alternative 1), reduced mining rate (Alternative 2), and alternative facility locations outside the Project Area (Alternative 3), were previously considered in the Pipeline project FEIS and eliminated from detailed analysis (BLM 1996a; pages 2-42 and 2-43). Summaries of these alternatives and the reasons for elimination from further consideration are presented in the Pipeline FEIS (BLM 1996a; pages 2-41 through 2-43). The fourth and fifth alternatives, reduced Project and alternative facility locations within the Project Area, were identified in the Project Scoping Document and are discussed below.

3.14.4.3.1 Alternative 1 - Underground Mining

This alternative was eliminated from further consideration for the following reasons:

- The South Pipeline ore body (disseminated gold deposit) is not amenable to underground mining methods; and

- Anticipated poor (unsafe) ground conditions in the oxidized portion of the ore zone.

3.14.4.3.2 Alternative 2 - Reduced Mining Rate

This alternative was eliminated from further consideration for the following reasons:

- Would increase time before full implementation of reclamation activities; and

- No environmental advantage.

3.14.4.3.3 Alternative 3 - Alternative Facility Locations Outside the Project Area

Alternative 3 considers alternative locations outside of the Project Area for major mine facilities (open pit, heap leach pads, and waste rock dump), which would be the facilities that would create the principal environmental impacts from the Proposed Action.

The location of the proposed open pit is strictly dictated by the location of the identified ore; there are no location alternatives for the open pit. The proposed locations of the Project heap leach pads and waste rock dump were selected by CGM after consideration of several operational, cost, and environmental factors that include the following: (a) minimization of the truck haul distance; (b) minimization of the gradient from the open pit to the waste rock dump and heap leach pads; (c) efficiencies in the construction and operation of the heap leach facility, including desire for gravity flow from the leach pad to the processing facility; (d) adequate ore (heap) and waste disposal capacity; (e) avoidance of sensitive environmental resources; (f) consolidation of mine facilities; and (g) absence of economic mineral reserves or potential economic reserves amenable to open pit mining below the heap leach pads and waste rock dump.

Relocation of either the heap leach pads or the waste rock dump from their locations under the Proposed Action to other locations outside of the Project Area would not avoid or substantially lessen any of the environmental effects of the Proposed Action. In addition, the Project, which is an expansion of the Pipeline project, is designed such that the Project utilizes existing facilities; therefore, alternative locations within the Project Area would result in increased surface disturbance and costs associated with new facility construction and longer haul distances. For the above reasons, this alternative was eliminated from further consideration.

3.14.4.3.4 Alternative 4 - Reduced Project Alternative

A reduced Project would result in the construction of a smaller open pit and smaller associated facilities. This alternative would reduce the effects of the Proposed Action to soils, vegetation, and ground water; however, this alternative does not meet the purpose and need of the Proposed Action. For this reason, the Reduced

Project Alternative has been eliminated from further consideration.

3.14.4.3.5 Alternative 5 - Alternative Facility Locations Within the Project Area

Alternative 4 considers alternative locations within the Project Area for layouts of the major mine facilities (open pit, heap leach pads, and waste rock dump), which would be the facilities that would create the principal effects of the Proposed Action.

Analysis of alternative locations under this alternative is similar to that under Alternative Facility Locations Outside the Project Area (Section 3.14.4.3.3). This alternative has been eliminated from further analysis because of substantial logistical and transportation disadvantages, and because it would result in increased surface disturbance.

4 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

4 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

4.1 Introduction

The geographic area considered for analysis of the Affected Environment and Environmental Consequences is based upon information received during the scoping process for the South Pipeline Project (Project) and identified in the Project Scoping Document which is on file and available for review at the Bureau of Land Management (BLM) Battle Mountain Field Office.

The study area for each resource topic in the Affected Environment includes the Project Area and, as appropriate for specific resources, the cumulative effects study area (CESA), in order to adequately evaluate the potential effects from the direct and indirect impacts of the Proposed Action. In general, the CESA extends from a point approximately 1 mile north of Mount Lewis in the Shoshone Range, east to the crest of the Cortez Range, southwest along the crest of the Cortez Mountain Range to Bald Mountain in the Toiyabe, west-northwest to Red Mountain, then north to the point of origin as described in Chapter 5 (Figure 5.1.1). The CESA for each resource is described in Chapter 5.

4.2 Geology and Mineral Resources

4.2.1 Regulatory Framework

Construction of mine facilities is regulated by standards of the Uniform Building Code (UBC). Lander County currently uses the 1994 version of the UBC (Ben Cornwall, Building Official, Lander County Building Department, personal communication). The seismic zone designation throughout Lander County is zone 3 on a scale ranging from 1 (indicating less damage expected) to 4 (indicating the most damage expected). Historic earthquake activity for a 50-mile radius around the Project Area is listed in Table 3.2-1 of the Pipeline project Final Environmental Impact Statement (FEIS) (BLM 1996a).

4.2.2 Affected Environment

4.2.2.1 Study Methods

The baseline data presented below is based upon information from the Pipeline project FEIS (BLM 1996a; pages 3-9 through 3-11). Discussions of geology, seismicity, and minerals are herein incorporated by reference. New and supplemental information is now available from more recent reports and studies. Summaries of studies completed in the area are included in the following sections. The Project Area is defined as a 29,350 acre area located in the southwest portion of the Crescent Valley extending north of the existing Highway infiltration site, south of the existing Rocky Pass infiltration site, east to the Cortez Facility, and west to the Shoshone Range.

4.2.2.2 Existing Conditions

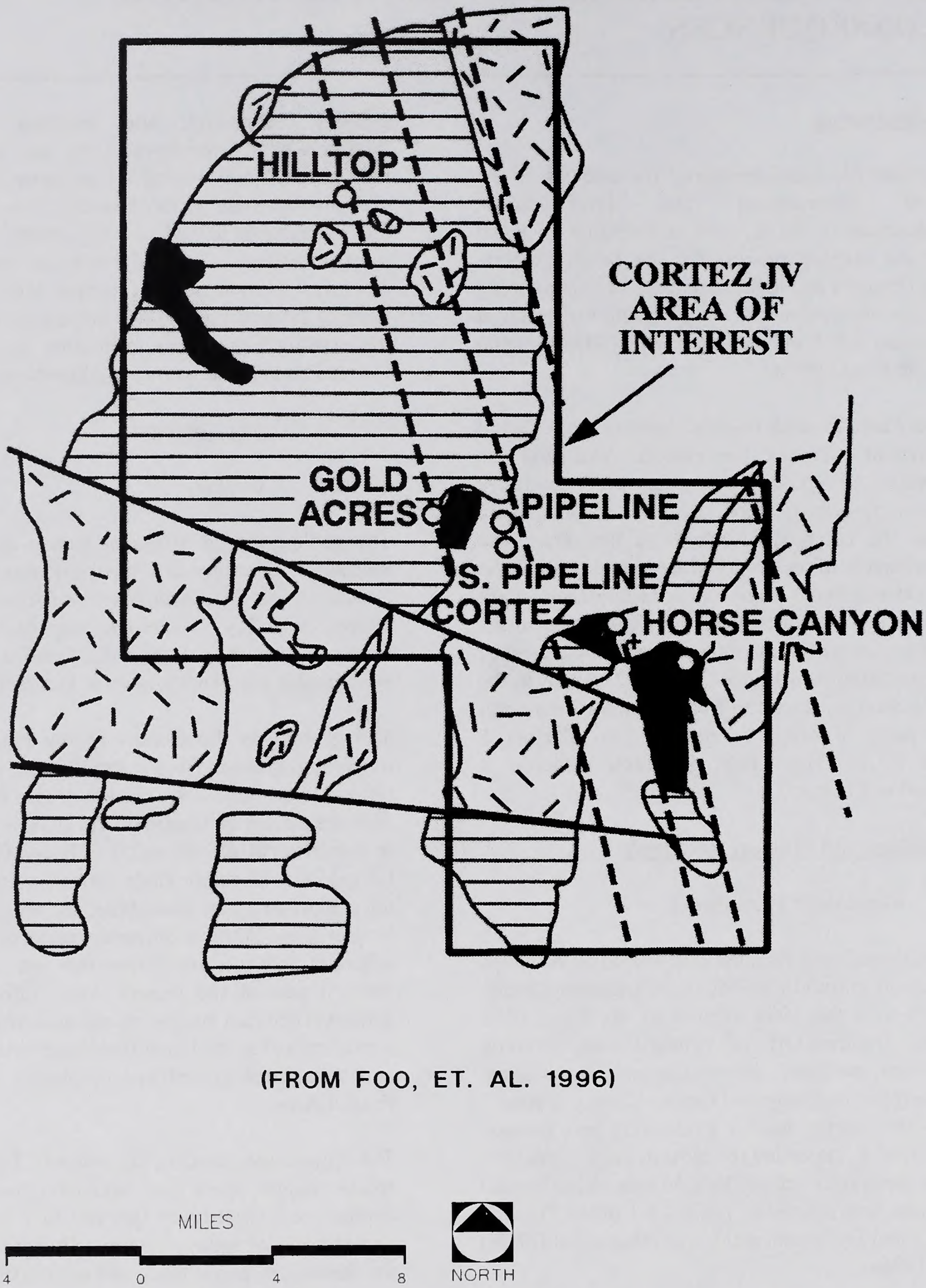
4.2.2.2.1 Geology

The geology of the Crescent Valley area has been thoroughly described in *Characterization of Baseline Conditions for the South Pipeline Project* (Geomega 1998b; page 21). A geologic map of the Crescent Valley is shown in Figure 4.2.1 and a generalized stratigraphic column is shown in Figure 4.2.2.

The geology in the vicinity of the Project Area is identical to that described in the Pipeline project FEIS (BLM 1996a; page 3-9). The lithologies in the Project Area are categorized based on the groupings presented in Roberts et al. (1958) and Gilluly and Gates (1965). Limestone with minor shale and quartzite are part of the eastern carbonate assemblage and are present in the Project Area. Clastic sedimentary rocks of the western siliceous and volcanic assemblage are found in the western part of the Project Area. Lithologic units deposited between the eastern and western assemblages are referred to as the transitional assemblage. Western and transitional assemblage lithologies underlie the Project Area.

The Project Area contains exposures of Tertiary age (2 to 24 million years ago) alluvial gravel and sand deposits and Quaternary (present to 2 million years ago) deposits of valley alluvium, alluvial fans flanking the mountains, playa, talus, and landslide deposits.

Excavation of the proposed open pit would be primarily in the Roberts Mountains Formation; a dark gray, carbon-rich, calcareous to dolomitic siltstone which extends to an estimated depth of 2,500 feet beneath the surface of the proposed open pit location. Some small exposures of the Wenban Limestone could also be present in the western pit wall. Overlying alluvium at



(FROM FOO, ET. AL. 1996)

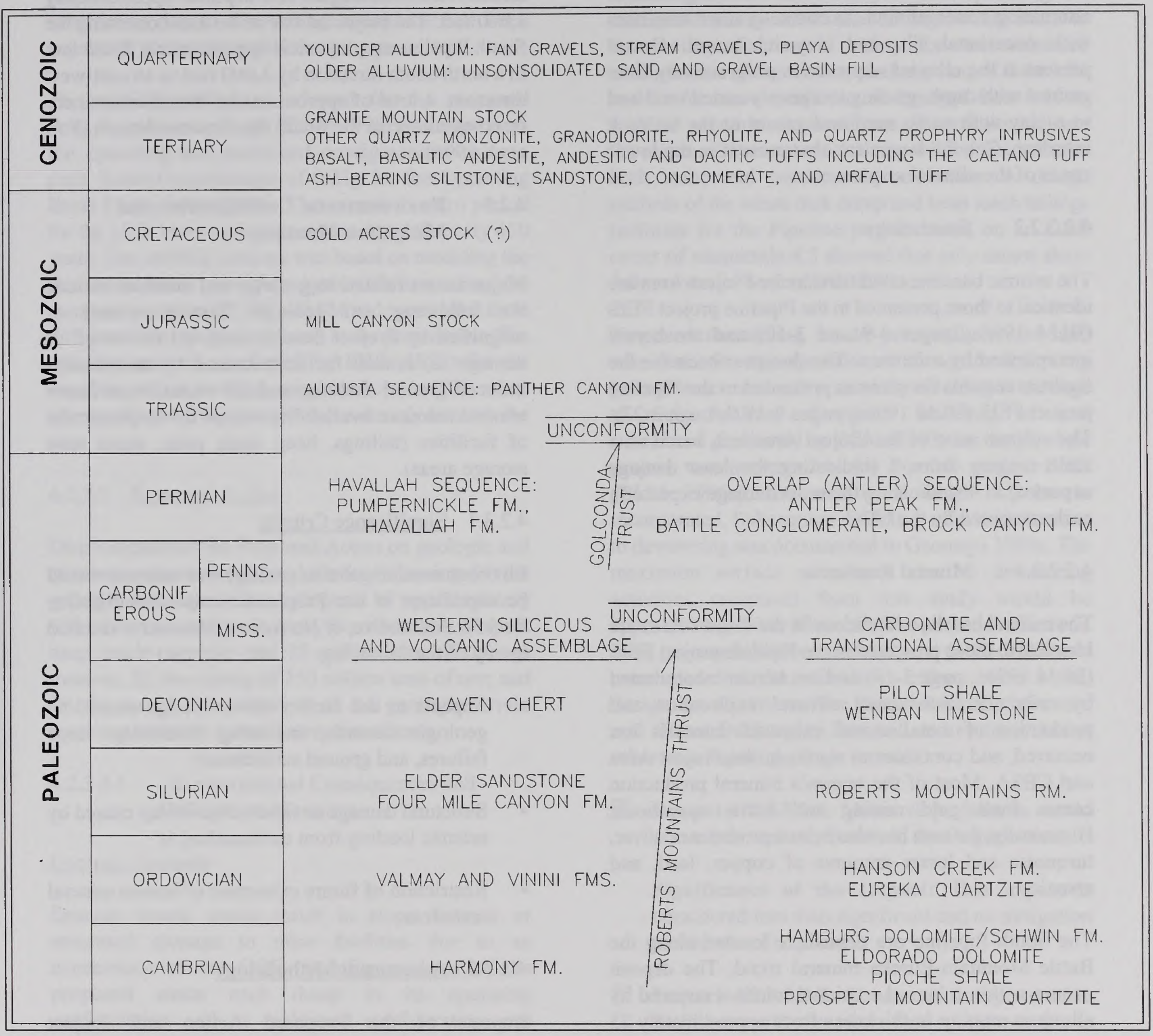
EXPLANATION

ALLUVIUM	UPPER PLATE LITHOLOGY
TERTIARY	LOWER PLATE LITHOLOGY
INTRUSIVE	FAULT

File: 1298-421-IGG
Date: 5/18/99
Reviewed By: KK & RD

SIMPLIFIED GEOLOGY OF THE AREA SURROUNDING SOUTH PIPELINE

Figure 4.2.1



E X P L A N A T I O N

File: 1298-422-IGG
Date: 5/18/99
Reviewed By: KK & RD

STRATIGRAPHIC COLUMN FOR CRESCENT VALLEY

Figure 4.2.2

the location of the proposed open pit would be 50 to 80 feet thick in the west pit wall and 350 to 380 feet thick in the east pit wall. The alluvium is composed of alternating zones of fine- to coarse-grained materials with occasional silt- and clay-rich zones. Gravel present in the alluvial sequence is progressively finer grained with depth, grading to a poorly sorted sand and to a clay with some sand and gravel at the bedrock interface. Caliche layers are also present in the lower zones of the alluvial sequence.

4.2.2.2.2 Seismology

The seismic baseline conditions in the Project Area are identical to those presented in the Pipeline project FEIS (BLM 1996a; pages 3-9 and 3-10) and are herein incorporated by reference. The design criteria for the facilities remains the same as presented in the Pipeline project FEIS (BLM 1996a; pages 2-19 through 2-22). The seismic zone of the Project Area is 3, based on a scale ranging from 1 (indicating the least damage expected) to 4 (indicating the most damage expected), as documented by the UBC.

4.2.2.2.3 Mineral Resources

The mineral baseline conditions in the Project Area are identical to those presented in the Pipeline project FEIS (BLM 1996a; page 3-10) and are herein incorporated by reference. Substantial mineral exploration and production of metallic and industrial minerals has occurred, and continues to occur, in the Project Area and CESA. Most of the region's mineral production comes from gold mining and barite operations. Historically, the area has also been a producer of silver, turquoise and lesser amounts of copper, lead, and arsenic.

The South Pipeline ore deposit is located along the Battle Mountain-Eureka mineral trend. The deposit occurs within a buried erosional window covered by alluvium ranging in thickness from approximately 25 feet to over 250 feet. Gold mineralization occurs in the Silurian Roberts Mountains Formation (eastern carbonate assemblage). The ore deposit occurs near the eastern margin of the Gold Acres stock, a buried quartz monzonite pluton centered approximately 1 mile south of the Gold Acres deposit. Based on exploration information, the geology in the South Pipeline ore deposit is very similar to that of the Pipeline ore deposit.

The deposit is a Carlin-type disseminated gold occurrence, similar to the Pipeline ore deposit, with gold mineralization disseminated throughout the host rock and along structural shear zones. The top of the targeted mineralization is approximately 33 feet and extends to 500 feet below the surface. A deeper mineralized zone begins at a depth of approximately 1,070 feet. The projected size of the area containing the South Pipeline ore deposit is approximately 2,400 feet in a north-south direction by 3,000 feet in an east-west direction. A total of approximately 98 million tons ore reserves comprise the South Pipeline ore deposit (Foo et al. 1996).

4.2.3 Environmental Consequences and Mitigation Measures

Major issues related to geology and minerals include the following: (a) geologic hazards created or magnified by Project development; (b) failure of, or damage to, critical facilities caused by seismically-induced ground shaking; and (c) exclusion of future mineral resource availability caused by the placement of facilities (tailings, heap leach piles, waste rock storage areas).

4.2.3.1 <u>Significance Criteria</u>

Environmental impacts to geology and minerals would be significant if the Proposed Action, the Pipeline Backfill Alternative, or No Action Alternative resulted in any of the following:

- Impacts to the facility site or design caused by geologic hazards, including landslides, slope failures, and ground subsidence;
- Structural damage or failure of a facility caused by seismic loading from earthquakes; or
- Restriction of future extraction of known mineral resources.

4.2.3.2 <u>Assessment Methodology</u>

Impacts of the Proposed Action and Project Alternatives were assessed based on review of reports prepared in support of the Pipeline project and presented in Pipeline project FEIS (BLM 1996a), review of the Project baseline characterization report (Geomega 1998b), review of the Plan of Operations (POO) for the Project (CGM 1996), and review of the Proposed Action. The significance of the impacts was evaluated based on the significance criteria listed above. Stability analysis of the Project waste rock dumps was analyzed in the POO. A similar stability analysis for the Pipeline project waste rock dump and heap leach facility was conducted by SHB (1993). Analysis of potential land subsidence was modeled by CGM (1993) for the Pipeline project and the potential

effects on mine facilities analyzed by SHB (1993). The results of the investigations are presented in Pipeline project FEIS (BLM 1996a). The issue of potential land subsidence due to dewatering operations had been expressed during the public scoping process.

The stability analysis conducted for the proposed Project waste rock dump (CGM 1996) evaluated both the operating and reclaimed configurations using a peak ground acceleration of 0.21g for the Operating Basis Earthquake (OBE). The expected return period for the OBE event was estimated at approximately 450 years. The stability analysis was based on modeling the minimum factor of safety against failure using the computer program PC-STABL5M and considered three different material types present at the project site. The stability analysis conducted by SHB (1993) for the Pipeline project facilities was based on an OBE event of magnitude 4.5 assumed to occur directly beneath the site.

4.2.3.3 Proposed Action

Direct impacts of the Proposed Action on geologic and mineral resources would include the following: (a) the generation and permanent disposal of approximately 450 million tons of waste rock, 75 million tons of spent heap leach material, and 75 million tons of tailings material; (b) the mining of 150 million tons of ore; and (c) the permanent alteration of the geologic terrain resulting in 4,450 acres of new disturbance.

4.2.3.3.1 Environmental Consequences and Mitigation Measures

Geologic Hazards

Seismic events could result in slope failures or structural damage to mine facilities due to an exceedance of the OBE. Stability analysis of the proposed waste rock dump in its operating configuration and its reclaimed configuration was conducted (CGM 1996). Factors of safety were calculated for accelerations ranging from 0.05g (0.05 times the acceleration of gravity) to 0.20g for static and pseudostatic (seismic) conditions. The OBE event has a peak ground acceleration of 0.21g and an expected return period of approximately 450 years. The expected 100-year return period seismic event for the site has a peak ground acceleration of 0.09g. Factors of safety greater than 1 indicate the facility is strong enough to support the designed load, and factors of safety less than 1 indicate that some failure of the facility would occur. The higher the calculated factor of safety, the greater certainty in the stability of the facility design. Factors of safety for the operational configuration of the waste rock dump were all greater than 1 for static conditions, and ranged from 0.70 to greater than 1,250, indicating some minor slope failures during an earthquake but no substantial damage would occur to the facility. Factors of safety for the reclaimed configuration of the waste rock dump ranged from 1.84 to 4.24 for static conditions, and ranged from 1.13 to 3.41 for pseudostatic conditions. The results indicate the slopes of the waste rock dump will be stable under both static and pseudostatic conditions. A design analysis of the waste rock dump and heap leach/tailings facilities for the Pipeline project based on an OBE event of magnitude 4.5 showed that only minor slope failures would occur (SHB 1993).

Proposed dewatering would potentially create land subsidence from compression of the aquifer following ground water removal, potentially resulting in damage to mine facilities. Computer modeling of land subsidence conducted by CGM (1993) for the Pipeline project was presented in the Pipeline project FEIS (BLM 1996a), the results of which are herein incorporated. Subsequent modeling of subsidence due to dewatering was documented in Geomega 1998a. The maximum surface subsidence due to dewatering activities computed from this study would be approximately 20 to 30 inches. The potential effects on mine process facilities were analyzed (SHB 1993) and concluded that the subsidence effects were within design specifications. The Partial Backfill, Injection, and Water Delivery to Private Land options do not otherwise impact geologic hazards.

▣ **Impact 4.2.3.3.1-1:** Minor slope failures would occur from seismic events in the Project Area.

Significance of the Impact: This impact is considered less than significant and no mitigation measures are required.

▣ **Impact 4.2.3.3.1-2:** Structural damage to mine facilities would occur from land subsidence due to dewatering activities.

Significance of the Impact: This impact is considered less than significant and no mitigation measures are required.

Mineral Resources

▣ **Impact 4.2.3.3.1-3:** Implementation of the Proposed Action would result in the production of approximately 4.58 million ounces of gold, negligible amounts of silver, and byproduct production of minor amounts of other metals.

Significance of the Impact: This impact is considered potentially significant, and no mitigation measures appear feasible.

The optional location of facilities, i.e., heap leach pad and waste rock dump, or the implementation of the Partial Backfill Option under the Proposed Action, could potentially conceal mineral resources. The proposed locations of the heap leach pad and waste rock dump would be at sites with no mineral resources or potential for economic mineral development. The Injection and Water Delivery to Private Land options do not otherwise impact mineral resources.

▣ **Impact 4.2.3.3.1-4**: The restriction of future mineral resource extraction due to facility location or placement of waste rock in the Pipeline open pit.

Significance of the Impact: This impact is considered potentially significant, and no mitigation measures appear feasible.

4.2.3.3.2 Residual Adverse Impacts

If the optional facility locations or Partial Backfill Option were implemented by CGM, then potential residual adverse impacts to mineral resources could occur as a direct result of the Proposed Action.

4.2.3.4 Pipeline Backfill Alternative

Implementation of the Pipeline Backfill Alternative would result in 250 million tons of waste rock being placed as backfill in the Pipeline open pit and approximately 200 million tons of waste rock being placed in the Project waste rock dump. This is equivalent to placement of approximately 45 percent of the waste rock generated by the Proposed Action as backfill in the Pipeline open pit. The Pipeline Backfill Alternative would reduce the total area of disturbance required for the proposed South Pipeline waste rock dump by 609 acres. The waste rock dump for the Pipeline Backfill Alternative would be 487 acres compared to the area of the Proposed Action waste rock dump of 1,096 acres.

4.2.3.4.1 Environmental Consequences and Mitigation Measures

The overall impacts of the Backfill Alternative on geology and mineral resources would be essentially identical to the impacts to geology and mineral resources from the Proposed Action (see Section 4.2.3.3.1). Those impacts that are identical are incorporated by reference. The implementation of the Pipeline Backfill Alternative could potentially conceal mineral resources.

▣ **Impact 4.2.3.4.1-1:** The restriction of future mineral resource extraction due to placement of waste rock in the Pipeline open pit.

Significance of the Impact: This impact is considered potentially significant, and no mitigation measures appear feasible.

4.2.3.4.2 Residual Adverse Impacts

Under the Pipeline Backfill Alternative potential residual adverse impacts to mineral resources may occur.

4.2.3.5 No Action Alternative

As a result of the No Action Alternative, none of the impacts to the geology and mineral resources generated by the Proposed Action or any alternative would occur.

4.2.3.5.1 Environmental Consequences and Mitigation Measures

Impacts on the geology and mineral resources would result from implementation of the No Action Alternative because identified mineral resources would not be developed.

▣ **Impact 4.2.3.5.1-1:** The restriction of future mineral resource extraction due to implementation of the No Action Alternative.

Significance of the Impact: This impact is considered significant, and no mitigation measures appear feasible.

4.2.3.5.2 Residual Adverse Impacts

Under the No Action Alternative residual adverse impacts to mineral resources would occur because the identified mineral resource would not be developed.

4.3 Soil Resources

4.3.1 Regulatory Framework

To minimize impacts from erosion on the Project Area, all mine facilities would be designed and constructed incorporating the use of Best Management Practices (BMPs) for erosion control (NRCS 1992). A Stormwater Pollution Prevention Plan (SPPP) is required for Project development and is implemented

by NDEP in accordance with the Nevada Stormwater NPDES permit program with appropriate erosion control features designed to meet the BMP performance standards. In addition, BLM surface management regulations at 43 CFR 3809.1-3(d) require mining-related activities to minimize impacts to soil resources.

4.3.2 Affected Environment

4.3.2.1 Study Methods

An Order II soil survey was conducted in 1992 for the Pipeline Gold Deposit baseline studies. Information was used from earlier Order III soil surveys of Lander County (Natural Resources Conservation Service [NRCS] undated) in addition to field sampling data and mapping to obtain the soil map units identified in the Pipeline project FEIS (BLM 1996a; Table 3.3-1).

4.3.2.2 Existing Conditions

4.3.2.2.1 Topography

The topography in the study area is typical of that found in the Basin and Range Physiographic Province. North to northeast-trending mountain ranges are separated by alluvial valley floors. The Project Area is situated on an alluvial fan at the eastern edge of the Shoshone Range.

4.3.2.2.2 Soils

In general, soils occurring within the Project Area are coarse textured in the western foothills of the area, and fine textured on the less steep slopes in the eastern portion of the Project Area. Soils range from moderately to very strongly alkaline, with strongly to very strongly alkaline soils predominating. For the primary purpose of mine reclamation, the soils in the Project Area are rated poor to fair for use as growth media. The limiting factors for suitability as growth media are clay content and alkalinity.

Several major soil associations occur within the Project Area and were identified in an Order III soil survey (Soil Conservation Service, undated). The associations include the Oxcorel-Beoska-Whirlo Association and Creemon silt loam.

The Oxcorel-Beoska-Whirlo association is the dominant soil that occurs in the Project Area. Major soils in this association include Oxcorel very fine sandy loam (40 percent), Beoska silt loam (30 percent), Whirlo gravely loam (15 percent), and contrasting inclusions (5 percent). Oxcorel soils are typically located on the upper summits of fan piedmont remnants. The potential of hydrogen (pH) ranges from moderately (pH 8.4) to strongly (pH 8.8) alkaline. The soil association is rated poor for topsoil suitability because of the presence of small stones and clay content. Beoska soils are typically located on the lower summit remnants. The pH ranges from moderately alkaline (pH 8.2) to very strongly alkaline (pH 9.7 to 10). The soil is derived from loess (wind-deposited, fine-grained material) over mixed alluvium. Whirlo soil is a strongly alkaline (pH 8.8 to 9.4) gravely loam. The soil is derived from mixed alluvium strongly influenced by loess.

Creemon silt loam type soil is very strongly alkaline (pH 9.3 to 10.1) throughout and is considered prime farmland when irrigated. The soil is derived from silty mixed alluvium influenced by volcanic ash.

4.3.3 Environmental Consequences and Mitigation Measures

4.3.3.1 Significance Criteria

The criteria used to evaluate the significance of potential impacts to soils are those criteria identified in the Pipeline project FEIS (BLM 1996a; page 4-13). The proposed Action would normally have a significant effect on the environment if it would:

- Cause erosion of disturbed or reclaimed sites that would overwhelm sediment control structures, block natural drainages leading to perennial waters; or
- Could not support revegetation; or
- Cause a loss of soils material during stockpiling or reclamation that would in turn limit reclamation success.

4.3.3.2 Assessment Methodology

The environmental consequences to soils of the Project Area were evaluated using soil mapping data and Project information. Baseline conditions for soils are herein incorporated by reference from the Pipeline project FEIS (BLM 1996a; pages 3-11 and 3-12). In addition, the information presented in Table 3.3-1 and Table 3.3-2 of the Pipeline project FEIS (BLM 1996a; pages 3-66 through 3-70). Soil Baseline Conditions, the Order II Soil Survey, the Order III Soil Survey, Table 3.3-1 and Table 3.3-2 remain applicable as reported in the Pipeline project FEIS (BLM 1996a).

4.3.3.3 Proposed Action

4.3.3.3.1 Environmental Consequences and Mitigation Measures

The expansion of operations as described in the Proposed Action would result in an additional 4,450 acres of disturbance over the currently permitted activities, for a total mining-related surface disturbance of 7,616 acres. For the Proposed Action, up to 1.7 million cubic yards of soils, covering approximately 4,450 acres, would be stripped and stockpiled for future use in reclamation activities.

Potential impacts to the soil resources include accelerated soil erosion rates and loss of productivity as a result of mining and reclamation activities. Accelerated soil erosion rates may occur during mine expansion due to the continued removal of vegetation, surface soil disturbance, soil compaction, soil salvaging, and reclamation. Plant cover provided by revegetation in the Project Area would be removed during mining operations, thereby increasing the potential for accelerated erosion rates.

Stockpiled soils would have higher than normal erosion rates until successful vegetation occurred. Successful revegetation of the stockpiles is anticipated to occur approximately 2 to 3 years after reseeding. At this time, plant cover would be sufficient to substantially decrease soil erosion. The sediment control structures would collect eroded soil from the stockpiles and eliminate the potential for off-site transportation of soil by water. Soil erosion caused by wind would be limited by the successful reclamation of the stockpiles.

Potential soil erosion rates and off-site sedimentation impacts associated with the Proposed Action or Alternatives would be reduced or avoided with the implementation of BMPs as described in Section 3.9 and concurrent reclamation activities described in Section 3.11. Following the reclamation of disturbed surfaces associated with the Proposed Action, the potential for continued erosion and off-site transportation of sediment from the Project Area would be greatly reduced. Waste rock dumps would be reclaimed concurrently with mining. Waste rock slopes would be graded from 2.5h:1v to 3h:1v slopes before the re-application of growth media. Growth media would be susceptible to wind and water erosion until revegetation efforts have provided adequate plant cover to reduce erosion potential. In addition, sediment control structures would collect eroded soils from waste rock dumps and eliminate the potential for off-site transportation of soil. The Partial Backfill, Injection, and Water Delivery to Private Land options do not otherwise impact soil resources.

▣ **Impact 4.3.3.3.2-1:** Accelerated soil erosion rates may occur during the mine expansion due to the continued removal of vegetation, surface soil disturbance, soil compaction, soil salvaging and reclamation.

Significance of the Impact: This impact is considered less than significant and no mitigation measures are required.

▣ **Impact 4.3.3.3.2-2:** Surface disturbance and soil compaction would reduce the water infiltration rate of soils potentially increasing runoff.

Significance of the Impact: This impact is considered less than significant and no mitigation measures are required.

Areas to be reclaimed consist of the South Pipeline waste rock dump, the new heap leach facility, the stockpile areas, haul and access roads and other ancillary facilities associated with the Proposed Action. A preliminary soil balance for the Project indicates 1.7 million cubic yards of material could be salvaged. Soil salvaging activities would include the stripping of surface and subsurface soils suitable for reclamation activities and the transportation and placement of these soils in stockpiles. Approximately 1 million cubic yards of material would be required to cover the Project's facilities, targeted for reclamation, to a depth of 12 inches. The amount would result in a surplus of 0.7 million cubic yards of material.

Soil productivity may decrease as a result of mine operations since growth media (i.e. salvageable surface and sub-surface soil) would be mixed during salvaging and stockpiling activities. Surface soils typically have a higher organic matter content and contain higher nutrient levels than subsurface soils. Soil biological activity and nutrient cycling would be substantially reduced or eliminated during stockpiling as a result of anaerobic conditions created in deeper portions of the stockpiles. If growth media were placed over waste rock, the character and texture of the original soils would be altered. Based on previous successful mine reclamation projects utilizing stockpiled and redistributed growth-media materials, it is not likely that the effectiveness of the soil material to function as growth-media would be significantly decreased.

▣ **Impact 4.3.3.3.2-3:** Soil productivity may decrease as a result of mine operations since growth media (i.e. salvageable surface and sub-surface soil) would be mixed during salvaging and stockpiling activities.

Significance of the Impact: This impact is considered less than significant and no mitigation measures are required.

4.3.3.3.2 Residual Adverse Impacts

Implementation of the Proposed Action would result in the unavoidable loss of those minor amounts of soils which can not be salvaged during construction.

4.3.3.4 Pipeline Backfill Alternative

General impacts to soils would be the same as those described for the Proposed Action. Implementation of this alternative would disturb 3,841 acres of soils or 609 acres fewer than the Proposed Action.

4.3.3.4.1 Environmental Consequences and Mitigation Measures

Implementation of this alternative would result in 3,841 acres of soil disturbance, which would be similar to those described for the Proposed Action.

4.3.3.4.2 Residual Adverse Impacts

Residual Impacts to soils would be similar to those as described under the Proposed Action.

4.3.3.5 No Action Alternative

4.3.3.5.1 Environmental Consequences and Mitigation Measures

The additional disturbance of soils associated with the Proposed Action would not occur with the No Action Alternative. Soil impacts would be limited to ongoing, permitted mining and exploration activities.

4.3.3.5.2 Residual Adverse Impacts

There would be no residual impacts to soils under the No Action Alternative except those previously evaluated in the Pipeline project FEIS (BLM 1996a).

4.4 Water Resources

4.4.1 Regulatory Framework

Approval of the Proposed Action would require authorizing actions from other federal, state, and/or local agencies with jurisdiction over the water resources aspect of the Project. The regulation, appropriation, and preservation of water in Nevada falls under both state and federal jurisdiction. When a proposed project has the potential to directly or indirectly affect the waters under State of Nevada jurisdiction, then the State of Nevada is authorized to implement its own permit programs under the provisions of state law or the Federal Clean Water Act (CWA).

The Nevada Division of Environmental Protection (NDEP) requires compliance with National Pollution Discharge Elimination System (NPDES) permits related to discharge of wastewater to surface waters from discharge points such as tailings piles and wastewater ponds, as well as with NPDES permits related to discharge of stormwater runoff. NDEP also requires that discharges into subsurface waters be controlled if the potential for contamination of ground water supplies exist. In such instances a state zero-discharge permit is required.

The Nevada Water Pollution Control Law provides the state authority to maintain water quality for public use, wildlife, existing industries, agriculture, and the economic development of the site. The NDEP defines waters of the state to include surface water courses, waterways, drainage systems, and underground water. The Nevada Water Pollution Control Law also gives the State Environmental Commission authority to require controls on diffuse sources of pollutants, if these sources have the potential to degrade the quality of the waters of the state. The U.S. Environmental Protection Agency (EPA) has also granted Nevada authority to enforce drinking water standards established under the CWA. The Nevada Division of Health administers this program.

The Nevada State Engineer's Office of Nevada Division of Water Resources (NDWR) is responsible for the administration and adjudication of water rights. Water appropriation permits are obtained through the Nevada State Engineer.

The U.S. Army Corps of Engineers requires a CWA Section 404 permit for any dredging or filling of wetlands or waters of the U.S. The Pipeline project is approved for a total of 2.837 acres of disturbance to jurisdictional waters of the U.S. under existing

nationwide permits. A recent waters of the U.S. evaluation (SRK 1999) concluded that a previous evaluation was incorrect and that total impacts under Nationwide Permits 12, 14, and 26 is 2.77 acres.

4.4.2 Affected Environment

4.4.2.1 Study Methods

Water resources information, descriptions, and data are based upon the information presented in the Pipeline project FEIS (BLM 1996a) along with updated information from ongoing monitoring, literature review, and an updated hydrologic baseline study and ground water flow model prepared for CGM by Geomega (1998a and 1998b). BLM specialists were aided by Mr. Jack Howell of HSI Geotrans, Reno, Nevada, and Mr. Chuck Zimmerman of Brown and Caldwell, Carson City, Nevada to peer review the hydrogeology and ground water modeling described in this section and the associated supporting documents.

Technical reports addressing geochemistry and pit water quality were prepared for CGM and include *South Pipeline Project Waste Rock Dump Study* (Geomega 1997) and *South Pipeline Project: Pit Lake Water Quality Prediction* (Geomega 1998c). Geochemistry and pit water quality issues were peer reviewed by Dr. James Drever, of the University of Wyoming.

The baseline data, ground water flow and pit lake water quality computer models, and associated reports were developed over a 5-year period by CGM contractors. The recent report, *Characterization of Baseline Conditions for the South Pipeline Project* (Geomega 1998a), summarizes the pertinent hydrologic characterization, monitoring data, interpretations of the prior reports, and incorporates updated information and comments from the BLM reviewers.

4.4.2.2 Existing Conditions

4.4.2.2.1 Conceptual Crescent Valley Basin Description

Crescent Valley, Hydrographic Basin No. 54 (study area), is within the Humboldt River Basin, which is in the Great Basin Region of the Basin and Range physiographic province. The Great Basin Region is characterized by alternating valleys and mountain ranges that are generally aligned north to south.

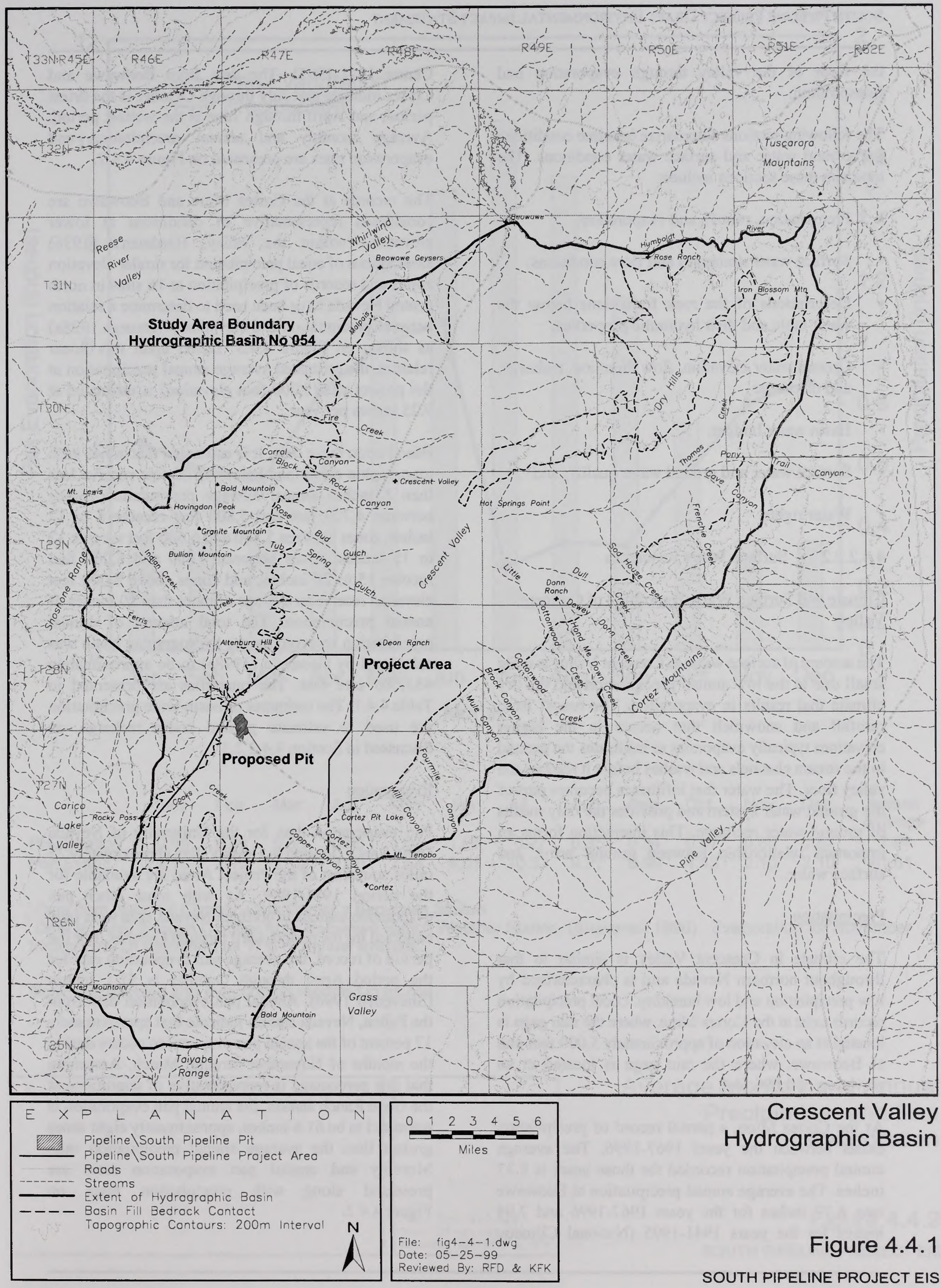
Crescent Valley is a semi-enclosed basin that is bounded on the west by the Shoshone Range, on the east by the Cortez Mountains, on the south by the Toiyabe Range, and on the north by the Dry Hills and Humboldt River (Figure 4.4.1). The drainage basin is approximately 45 miles long, 20 miles wide, and includes an area of approximately 750 square miles. Elevations range from 9,680 feet amsl at Mount Lewis in the Shoshone Range to 4,695 feet amsl at the north end of Crescent Valley near Beowawe.

Water enters the basin primarily as precipitation and is discharged primarily through evaporation and transpiration. Relatively small quantities of water enter the basin as surface flow and ground water underflow from the adjacent Carico Lake Valley at Rocky Pass, where Cooks Creek enters the southwestern end of Crescent Valley.

The potential evaporation from the basin greatly exceeds the amount of water available from precipitation and inflow. There are no year-round bodies of surface water in Crescent Valley. Most of the streams in the basin are intermittent or ephemeral streams that drain from the mountain ranges toward the center of the basin. The streams flow only seasonally or in response to snowmelt and precipitation events. Some segments of streams, such as Indian Creek, have flow throughout the year where perched ground water contributes to springs that flow into the streams. None of the streams in Crescent Valley are categorized as perennial streams over their entire length, however, because the flows diminish as water infiltrates into the permeable alluvial fan deposits around the margins of the basin, downstream from the bedrock that makes up the mountains and foothills (Zones 1961). A number of dry lake beds, or playas, occur in the central valley floor. The playas typically contain water only temporarily after substantial storm and snow melt events.

The Crescent Valley floor consists of finer grained sediments and deep-rooted phreatophyte vegetation types (primarily saltgrass and greasewood) that thrive on the shallow ground water in this area. The basin's primary means of discharge is evapotranspiration, either directly, by evaporation from the playas and ground surface shortly after precipitation, or by transpiration from the phreatophytes in the central valley floor.

A large volume of ground water is stored beneath the valley floor within the saturated alluvial sediments. This ground water reservoir receives recharge from infiltration of precipitation and streams that flow across the alluvial fans that flank the valley. The amount of ground water in storage is maintained at a relatively constant volume by the natural discharges occurring on



Crescent Valley
Hydrographic Basin

Figure 4.4.1

SOUTH PIPELINE PROJECT EIS

the floor of the valley through evaporation and transpiration.

The following sections summarize baseline conditions for ground water and surface water conditions. The topics in these sections include:

- Precipitation, runoff, and evaporation;
- Surface water drainages and flow conditions;
- Descriptions of the rock formations below the water table and their hydraulic properties;
- Ground water elevation, flow direction, recharge, and discharge;
- Basin water budget;
- Surface water and ground water quality; and
- Water rights.

4.4.2.2.2 Surface Water Resources

Climate and Surface Water Hydrology of Crescent Valley

The amount of surface water in Crescent Valley is quite small due to the low annual precipitation and the dry climate that results in evaporation. The runoff from rainfall and snowmelt that occurs in the higher elevations typically evaporates or infiltrates the ground in the stream channels and washes before it reaches the valley floor. The water that infiltrates becomes part of the ground water system and provides the only means of ground water recharge. This interaction forms an important relationship between ground water and surface water.

Precipitation

The climate in Crescent Valley is similar to that throughout northern Nevada and is characterized by low precipitation and low humidity. Local precipitation records exist at the Cortez Mine, where the rain gage is located at an elevation of approximately 5,000 feet and at Beowawe, where the rain gage is located at an elevation of 4,696 feet.

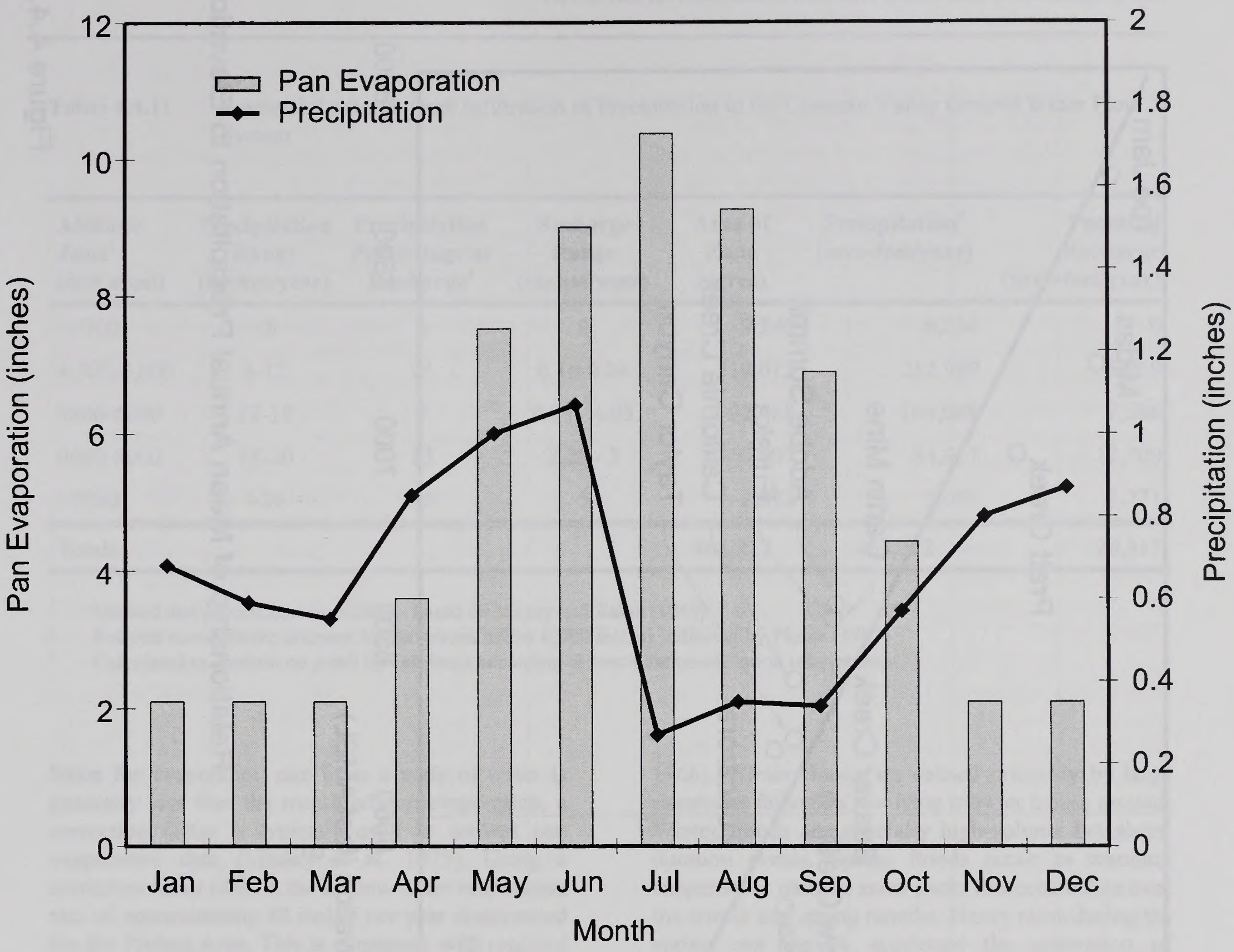
At the Cortez Mine, a partial record of precipitation exists between the years 1967-1996. The average annual precipitation recorded for those years is 8.37 inches. The average annual precipitation at Beowawe was 8.77 inches for the years 1967-1996 and 7.94 inches for the years 1941-1995 (National Climatic Center 1941-1995). The data from Beowawe and Cortez indicate that July through October is the driest period, and April through June is the wettest period. Average monthly and annual precipitation and evaporation rates are presented on Figure 4.4.2.

The records at the Cortez Mine and Beowawe are considered representative of conditions at lower elevations within the valley. Hardman's (1936) assumptions of equal precipitation for similar elevation zones and records of precipitation at 16 sites in north central Nevada have been used to determine a relation between precipitation and elevation (Geomega 1998a) as shown on Figure 4.4.3. Based upon this linear relation, the estimated average annual precipitation at the project site (5,000-foot elevation) is estimated at 9.25 inches per year.

Based upon these data, it is estimated that zones with topographic elevations below 4,700 feet receive less than 8 inches annual average precipitation, zones between 4,700 feet and 5,800 feet receive 8 to 12 inches, zones between 5,800 and 6,600 feet receive 12 to 15 inches, zones between 6,600 and 8,000 feet receive 15 to 20 inches, and zones above 8,000 feet elevation receive an average of more than 20 inches of annual precipitation. The total amount of annual precipitation received by the hydrographic basin was calculated by Geomega (1998a) to be approximately 453,000 acre feet. The quantities are presented in Table 4.4.1. The estimates of basin-wide precipitation are used to estimate ground water recharge, as discussed in Section 4.4.2.2.3.

Evaporation

Pan evaporation data for the University of Nevada Gund Ranch (located in Grass Valley approximately 25 miles southeast of the Project Area) are available for the period 1981-1989. As with most other pan evaporation stations in northern Nevada, data were only collected for the period April through October. For the period of record, the average pan evaporation rate for the period April through October is 51.1 inches (Shevenell 1996). Annual pan evaporation data from the Fallon, Nevada station indicate that approximately 17 percent of the annual pan evaporation occurs during the months of November through March. Assuming that this percentage is representative of conditions at the Gund Ranch station, the annual pan evaporation is estimated to be 61.6 inches, approximately eight times greater than the average annual precipitation rate. Monthly and annual pan evaporation rates are presented along with precipitation rates on Figure 4.4.2.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Average
Precipitation[1]	0.68	0.59	0.55	0.85	1.00	1.07	0.27	0.35	0.34	0.57	0.80	0.87	7.94
Pan Evap[2]	2.10	2.10	2.10	3.60	7.53	9.01	10.37	9.27	6.90	4.43	2.10	2.10	61.61

[1] Data from National Climatic Data Center's Beowawe Station

[2] Data for April through October from Beowawe Ranch Weather Station (Shevenell 1996). Evaporation for November through March estimated as 17% of annual average.

Note: precipitation and evaporation reported in inches.

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Average Monthly and Annual Precipitation and Pan Evaporation

Figure 4.4.2

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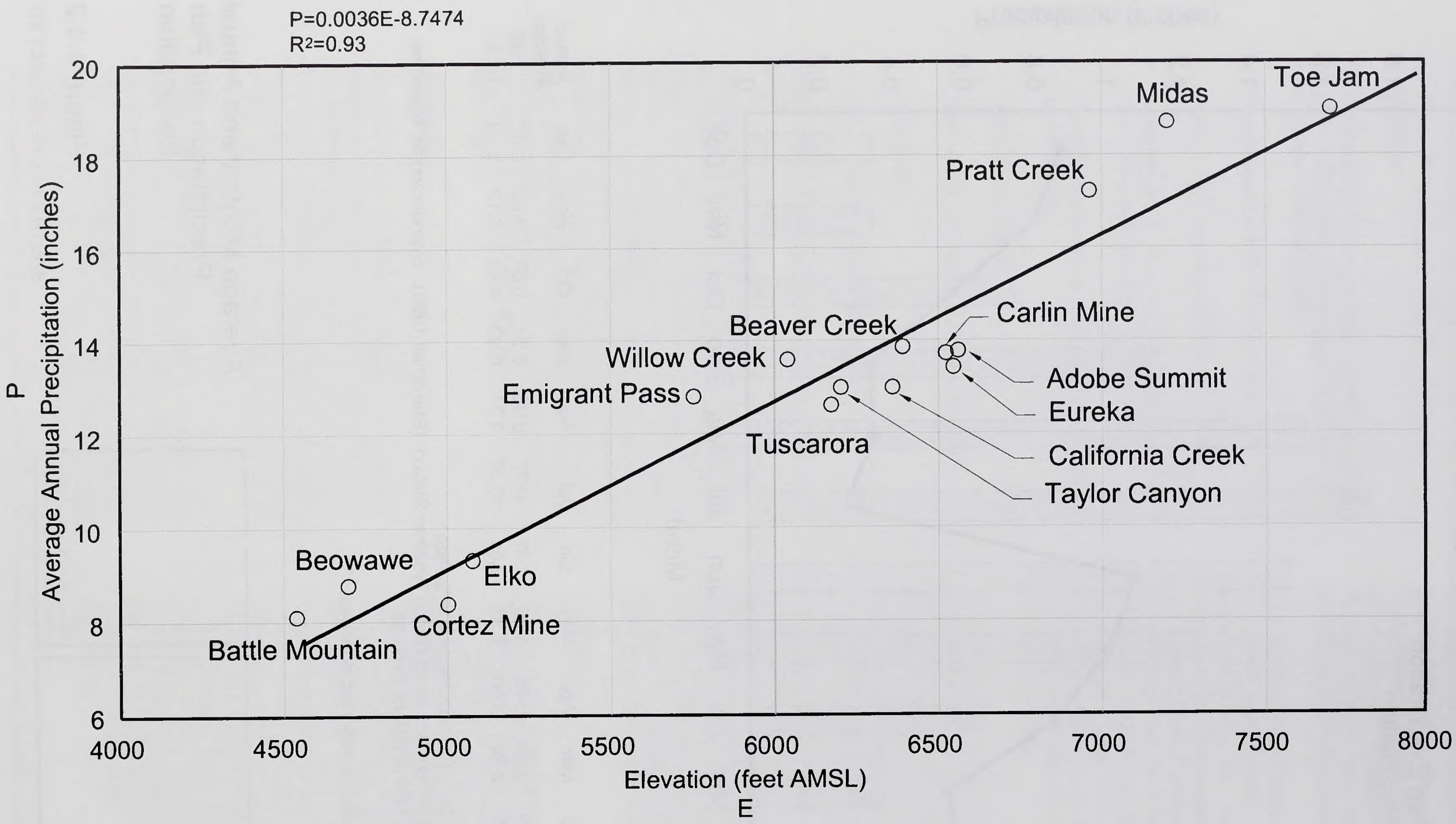

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Relationship of Mean Annual Precipitation to Elevation

Figure 4.4.3

Table 4.4.1: Potential Recharge from Infiltration of Precipitation to the Crescent Valley Ground Water Flow System

Altitude Zone[1] (feet amsl)	Precipitation Range (inches/year)	Precipitation Percentage as Recharge[1]	Recharge Range (inches/year)	Area of Zone (acres)	Precipitation[3] (acre-feet/year)	Potential Recharge (acre-feet/year)
<4700	<8	0	0	9,240	6,234	0
4,700-5,800	8-12	2[2]	0.16-0.24	319,012	252,999	5,060
5800-6600	12-15	7	0.84 - 1.05	92,468	104,089	7,286
6600-8000	15-20	15	2.25 - 3	60,607	84,667	12,700
>8000	>20	25	5	2,872	5,083	1,271
Totals				484,217	453,072	26,317

[1] Method and percentages as recharge based on Maxey and Eakin (1949)
[2] Reflects conservative estimate for elevations below 6,000 feet, as indicated by Plume (1995)
[3] Calculated in ArcInfo on a cell by cell basis according to precipitation-elevation relationship

Since the evaporation rate from a body of water is generally less than the measured pan evaporation, a correction factor is typically used to convert pan evaporation data (Linsley et al. 1975). Using a correction factor of 0.78, the shallow water evaporation rate of approximately 48 inches per year is estimated for the Project Area. This is consistent with regional estimates of Houghton et al. (1975). The net evaporation from a water surface at the Project Area is calculated to be 38.75 inches per year, based on an evaporation rate of 48 inches per year minus average annual precipitation of 9.25 inches per year.

Runoff

Most of the annual runoff within and through the Project Area is derived from snowmelt. A large percentage of the annual precipitation falls as snow and is stored as snow pack in the higher elevations during the winter months. In the spring months, typically April through early June, water from snowmelt produces significant runoff. In many of the high mountain drainages, this snowmelt runoff produces the highest annual flows. Occasionally, spring season rainfall coincides with the snowmelt runoff, resulting in extremely high runoff flows. The hot, dry weather in mid to late summer produces the lowest annual flows due to little or no rain and high evaporation rates.

Flooding typically occurs in the Humboldt River Basin in both the winter and spring seasons (Eakin et al. 1966). Winter floods are caused primarily by large rainstorms falling on low-lying snow or frozen ground. Winter floods are generally high-volume but short-duration events. Spring floods occur as warming temperatures melt the snow packs that accumulate over the winter and spring months. Heavy rains during the spring can rapidly accelerate the generation of snowmelt runoff. Summer flash floods can also occur as the result of localized high-intensity rainfall from thunderstorms. The large-volume, short-duration storms that cause flash flooding can exceed the snowmelt peak flow in magnitude. Flash floods, caused by thunderstorms originating in the mountains, deposit large volumes of debris and sediment on the valley uplands or valley floor.

Many of the streams which drain snowmelt or rainfall from the mountains surrounding Crescent Valley do not reach the dry lake beds on the valley floor; instead, they branch into smaller channels that eventually run dry. Runoff from Crescent Valley does not flow into the Humboldt River with the exception of Coyote Creek, an intermittent stream that flows north from the Malpais to the Humboldt River and several small ephemeral streams that flow north from the Dry Hills. Surface water flow in the Carico Lake Valley coalesces into Cooks Creek, which enters Crescent Valley through Rocky Pass. Cooks Creek flows approximately 1 mile into Crescent Valley and then becomes dry.

In the upper reaches of drainage basins, where the stream beds are underlain by bedrock, the streams typically do not lose substantial water to infiltration. As the streams flow toward Crescent Valley, they quickly lose water by infiltration through permeable alluvial fan deposits. Runoff reaches the valley floor only during high flows (Zones 1961). Within the study area, most of the streams do not flow year-round, with the exception of short perennial segments of spring-fed streams, such as Indian Creek. The center of Crescent Valley consists of dry lake beds that are separated from the Humboldt River by a low topographic divide at the northern end of the valley.

Surface Water Use

When available, surface water in some areas of Crescent Valley is used for irrigation, livestock water, mining, and by wildlife. There is no historic or existing use of surface water for domestic purposes within the Project Area.

Description of Crescent Valley Drainages

Toiyabe Range and Northeastern Carico Lake Valley Drainages

Three drainages originating in the Toiyabe Range enter Crescent Valley (Figure 4.4.1). Surface water in the northeastern portion of Carico Lake Valley drains via Elder Creek, which joins Cooks Creek at Rocky Pass. The surface water flow, which generally occurs only after heavy precipitation or snowmelt runoff enters Crescent Valley, usually seeps into alluvial material within 1 mile of Rocky Pass. A small amount of ground water underflow through Rocky Pass is believed to occur year-round (Zones 1961).

Two catchment areas (designated as Toiyabe Catchment areas No. 1 and No. 2) also drain into Crescent Valley from the Toiyabe Range. Seventeen springs have been mapped (JBR 1993) in the higher elevations in Catchment area No. 1. Three unnamed creeks and Copper Canyon form the drainage for Catchment area No. 2. No flow was observed in any of the unnamed drainages in the area during a field reconnaissance in August 1992 (WMC 1992b).

Cortez Mountains Drainages

Eleven creeks drain into Crescent Valley from the Cortez Mountains within the study area (Figure 4.4.1). They are, from north to south: Frenchie Creek, Sod House Creek, Duff Creek, Dewey Dann, and Hand-Me-Down Creek, Little Cottonwood Creek, Cottonwood Creek, Brock Canyon, Mule Canyon, Fourmile Canyon, Mill Canyon, and Cortez Canyon. Of the 11 creeks, only Frenchie Creek, Sod House Creek, Duff Creek, Brock Canyon, Fourmile Canyon, and Mill Canyon had measurable flow during reconnaissance in August and September 1992.

The lower portion of Thomas Creek flows into the Crescent Valley within the study area. Thomas Creek drains a portion of Iron Blossom Mountain and flows intermittently where springs flow into it. No flow was observed in August 1992 at a point about 1 mile down-stream of the springs.

Dry Hills Drainages

Three drainages that originate in the Dry Hills/Iron Blossom Mountain area drain toward the Humboldt River northeast of Crescent Valley without entering Crescent Valley, but are included within the same Hydrographic Basin, No. 054. They are Safford Canyon, Rocky Canyon, and Scott's Gulch. There was no flow in Safford Canyon on August 25, 1992. No flow records are available for Rocky Canyon and Scott's Gulch.

Shoshone Range Drainages

The streams that drain the eastern side of the Shoshone Range are longer and have a more gradual slope than those that drain the western slopes of the Cortez Mountains on the opposite side of Crescent Valley. From north to south the streams draining into Crescent Valley from the Shoshone Range are: Fire Creek, Corral Canyon, Black Rock Canyon, Mud Spring Gulch, Indian Creek, and an unnamed drainage west of Gold Acres. The largest stream of the Shoshone Range is Indian Creek, which is located about 5 miles north of the Pipeline open pit and includes the tributaries Ferris Creek, Chicken Creek, and Grouse Creek. Portions of Indian Creek and upper reaches of Fire Creek are known to flow year-round. All of these streams, including Indian Creek, dry up and disappear as they cross the valley upland and flow towards the valley floor.

During August 1992 the flow observed in upper Fire Creek was 16 gpm. The unnamed drainage near Gold Acres was dry. In September 1992 a flow of over 400 gpm was observed in Indian Creek about 2 miles east of the Lander town site. CGM monitors the flow in Indian Creek quarterly. No flow records exist for the other Shoshone Range drainages.

Surface Water Hydrology in the Vicinity of the Proposed Action

The Project Area is located in the unnamed drainage north of Squaw Butte on the eastern flank of the Shoshone Range. The areas surrounding the proposed facilities contain numerous channels and washes that flow only during times of intense precipitation and snowmelt. The watersheds above the Proposed Action facilities drain a total area of about 14.3 square miles (9,140 acres) of steeply to moderately sloping terrain. Topographic elevation varies from about 5,150 feet at the road above the mill site to 6,690 feet at the highest point within this local watershed. The longest water course is approximately 5.3 miles with a change in elevation of about 1,240 feet. The watershed above the site is divided into seven sub-basins, ranging in size from 1.1 to 4.2 square miles.

Runoff from the maximum 24-hour storm events expected to occur at 25-year and 100-year intervals were evaluated using rainfall depths selected from the Precipitation Frequency Atlas 2 for Nevada, Volume VII, and soil type information obtained from the NRCS. Much of the watershed is characterized by poorly drained soils with relatively high levels of runoff.

A precipitation depth of 2.4 inches was anticipated for use in this analysis for the 100-year recurrence interval event within the higher watersheds and 2.2 inches was used for the remaining watersheds at lower elevations. The corresponding precipitation depths estimated for the 25-year event were 1.8 to 2.0 inches. Distribution of the 24-hour rainfall was anticipated to follow the pattern of the Type II storm distribution developed by the NRCS. Peak flows for the various design storms were estimated by CGM (1992) using the NRCS Hydrograph Method as available in the HEC-1 Model developed by the Hydrologic Engineering Center, U.S. Army Corps of Engineers. On the basis of this analysis, the peak runoff estimated for the 25-year, 24-hour storm is 1,400 cfs, and 2,200 cfs for a 100-year, 24-hour storm. A diversion structure has been constructed to divert this flow from the unnamed basin west of the mine site around the existing Pipeline facilities.

The FEMA floodplain maps for the Proposed Action were reviewed for identification of floodplains in the vicinity of the mine site. The mine site is located in an area identified as being outside the area that would be inundated by the 500-year storm (the 500-year floodplain). The nearest mapped flood hazard area is the 100-year floodplain, located about 3 miles to the southeast (FEMA 1988) of the mine site.

Delineation surveys of jurisdictional waters of the U.S. were conducted by JBR in 1993, WESTEC in 1994, 1995, and 1997, and SRK in 1999. These surveys indicate that previously approved CGM activities resulted in a total of 2.837 acres of impacts to waters of the U.S. and are included under existing Nationwide Permits. A recent waters evaluation concluded that total impacts of the Project to jurisdictional waters under Nationwide Permits would be 2.77 acres (SRK 1999). A Section 404 permit is required prior to discharges of dredged or fill material into waters of the U.S. (Dept. of the Army, August 1, 1997). There are no wetlands (areas inundated or saturated by surface or ground water at a frequency and duration sufficient to support a prevalence of vegetation adapted to saturated soil conditions) within the Project Area.

4.4.2.2.3 Ground Water Resources

Hydrogeology of Crescent Valley

The hydrogeology of Crescent Valley, and, to a much smaller degree, the Cortez Mountains and Shoshone Range surrounding Crescent Valley, have been studied by the USGS and reported in Water-Supply Paper 1581 (Zones 1961). The USGS has recently published *Potential Hydrologic Effects of Mining in the Humboldt River Basin* (Crompton 1995), which includes an evaluation of Crescent Valley. Recent studies by USGS (Maurer et al. 1996) address ground water hydrology and potential effects of mining along the Carlin Trend, including the area immediately north of the study area across the Humboldt River from Crescent Valley (Plume 1995). Hydrogeologic reports prepared by WMC (1992a; 1992b; 1993; and 1995a) and Geomega (1998a; 1998b) for the applicant provide additional information on water resources in Crescent Valley and, more specifically, on the Proposed Action. Much of the following section is derived from Geomega (1998a) and BLM (1996a).

Ground water in the Cortez Mountains and Shoshone Range surrounding Crescent Valley occurs mainly in joints and fractures within the metamorphic and sedimentary bedrock. Most precipitation falling on the mountains travels downslope in ephemeral streams toward the valley floor. Recharge from the runoff enters the regional ground water system as it crosses the alluvial fan deposits of the valley at the base of the mountains. Ground water moves through these deposits towards the alluvial aquifer beneath the valley floor, where large quantities of ground water are stored. The valley floor is a relatively flat area of playas, small dunes, and some terraces. Geophysical data from gravity and seismic surveys conducted by the USGS and others show that the alluvium may be as much as

9,300 feet thick in some portions of Crescent Valley (WMC 1992b, Gilluly et al. 1965).

Principal Aquifer Units

Ground water flow in the Crescent Valley Hydrographic Basin occurs in several bedrock and alluvial aquifers that exist within the following rock units:

Bedrock:	Carbonate rocks Siliceous rocks Volcanic rocks Intrusive rocks
Unconsolidated Deposits:	Older Basin-Fill Younger Basin-Fill Playa

The carbonate bedrock and younger basin-fill aquifers are of primary interest in the Project Area because these aquifers are present in the upper 1,000 feet in the vicinity of the Proposed Action. Figure 4.4.4 presents a generalized geologic map and cross sections that show the relative positions of geologic formations in the Gold Acres window and pit areas. The following sections describe the occurrence, extent, and hydraulic characteristics of these aquifer units.

Knowing the hydraulic characteristics of an aquifer provides information on how much water it contains, how easily water flows through it, how much water is in storage, and the quantity of water that a well may produce from a given formation. These characteristics can also be used to estimate how much a well or series of wells might drawdown (lower) the level of the water table under pumping conditions.

The basic aquifer characteristics described below include porosity, hydraulic gradient, hydraulic conductivity, transmissivity, storage coefficient, and specific yield.

Carbonate Rocks

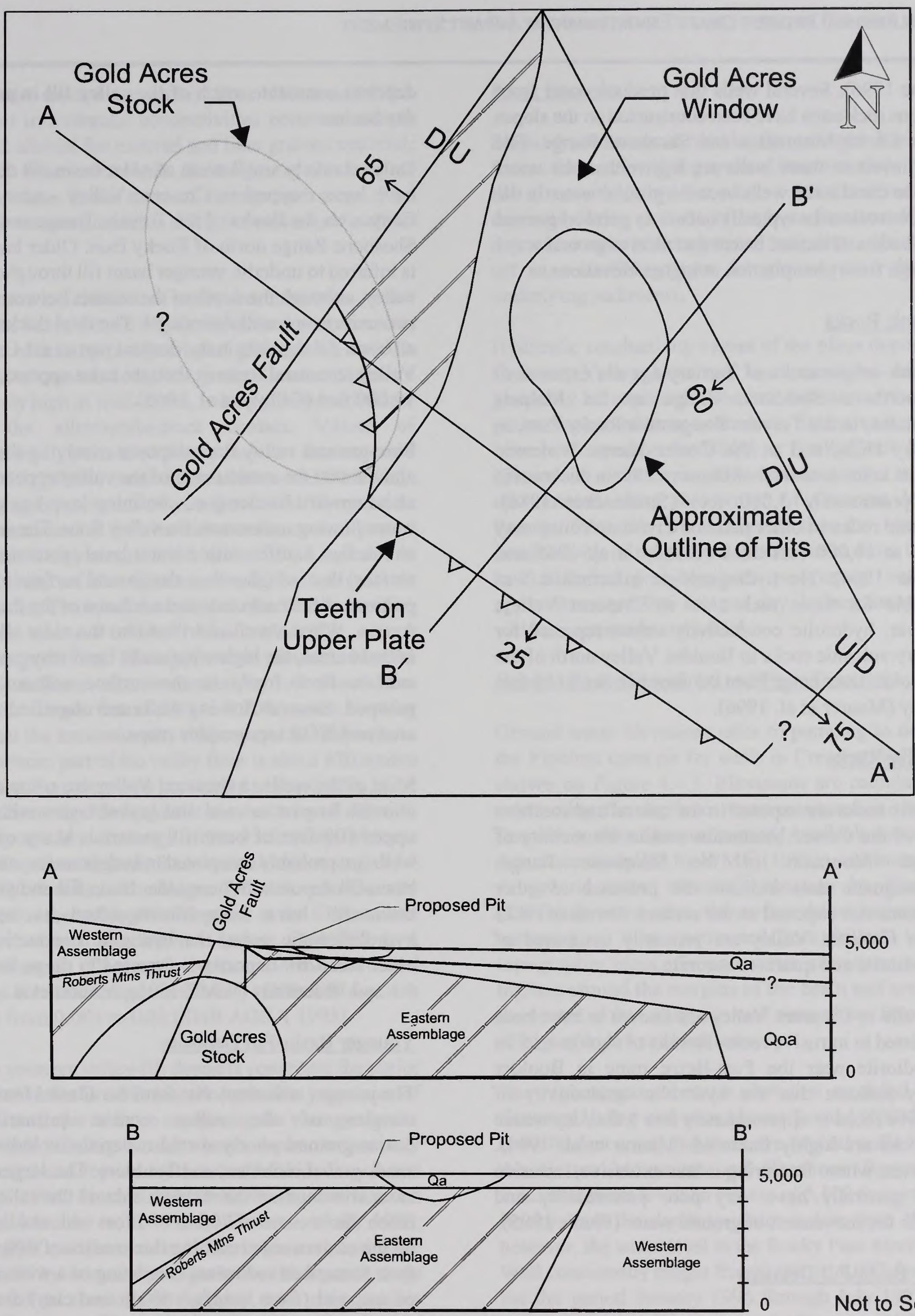
The western edge of a regional carbonate-rock (a rock composed mostly of the mineral calcium carbonate) aquifer system that covers much of southern and eastern Nevada and western Utah is present approximately 30 miles east of the Project Area. Within the study area, there is an isolated block of uplifted carbonate rocks of the eastern and transitional assemblages approximately 8 square miles in an area known as the Gold Acres window that is composed of the Roberts Mountains Formation, Wenban Limestone, and Pilot Shale. The Roberts Mountains Formation is a localized water-bearing bedrock unit in the vicinity of the Proposed Action. The Roberts Mountains Formation is also exposed near the Cortez Mine in the Cortez Mountains. Based upon exploration drilling for the project, it is estimated that the Roberts Mountains Formation extends to a depth of 2,500 feet in the pit area (Foo et al. 1996).

Aquifer pumping and well production tests conducted in the Project Area (WMC 1992b and Geomega 1998a) indicate that ground water flow in the carbonate rocks is controlled by geologic structures such as faults and fractures and boundaries with less permeable rocks. Ground water flow within the Gold Acres window appears to be compartmentalized within the limits of these hydrologic boundaries and geologic structures. Ground water levels in the Roberts Mountains Formation near the Proposed Action are about 300 feet below the land surface (about 4,795 feet of elevation) and are similar to the levels of the water table in the alluvium in the basin. Transmissivity values (the rate at which water flows through a unit thickness of an aquifer) range from 2,500 to 140,000 square feet per day, with the higher values probably corresponding to localized zones of interconnected faults and fractures.

Siliceous Rocks

Siliceous rocks consist of the Antler Sequence and Western Assemblage rocks, which include chert, argillite, shale, siltstone, sandstone, conglomerate, quartzite, and minor amounts of other rock types including some carbonate rocks. Siliceous rocks overlie the carbonate rocks throughout much of Crescent Valley. Drill hole data and geologic mapping suggest that the siliceous rocks may be up to 3,000 feet thick in the Indian Creek area north of the Proposed Action. The data are unclear as to the extent of these rocks beneath the valley floor between the Pipeline deposit and the Cortez mine.

Ground water flow is controlled by the presence of geologic structures such as faults and fractures, similar to the carbonate aquifer units. In unfractured rock, the hydraulic conductivities are low, ranging from 5×10^{-6} to 1×10^{-1} feet per day. Wells that have intercepted fracture zones have test pumped up to 130 gpm (WMC 1992b) and transmissivity is calculated from one test well at 6,200 square feet per day (Geomega 1998a). The hydraulic conductivities of siliceous rocks are low where the rocks have not been affected by faults and fracture zones; in general, these rocks are thought to act as potential barriers to regional ground water flow



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Generalized Geology and Geometry of the Gold Acres Window

Figure 4.4.4

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(Plume 1996). Several wells that produce water from siliceous rock units have been constructed on the slopes of the Cortez Mountains and Shoshone Range. The water levels in these wells are higher than the water levels in the alluvial wells because ground water in the siliceous rock units typically occurs as perched ground water bodies of limited extent that receive ground water recharge from precipitation at higher elevations.

Volcanic Rocks

Volcanic-origin rocks of Tertiary age are exposed in the northern Shoshone Range in the Malpais Mountains, in the Toiyabe Range near Rocky Pass, in the Dry Hills, and in the Cortez Range. Volcanic deposits in the area west of Beowawe attain thicknesses of approximately 3,000 feet (Struhsacker 1986). Volcanic rocks in other parts of Crescent Valley may be up to 10,000 feet thick (Gilluly et al. 1965 and Muffler 1964). No hydrogeologic information was available for these rock units in Crescent Valley; however, hydraulic conductivity values reported for Tertiary volcanic rocks in Boulder Valley north of the Humboldt River range from 0.1 foot per day to 10 feet per day (Maurer et al. 1996).

Intrusive Rocks

Intrusive rocks are exposed in the central and southern parts of the Cortez Mountains and in the vicinity of Granite Mountain in the Shoshone Range. Aeromagnetic data indicate the presence of other intrusions not exposed at the surface. Intrusive rocks within Crescent Valley are primarily composed of granodiorite and quartz monzonite.

No wells in Crescent Valley are known to have been completed in intrusive rocks. Results of aquifer tests in granodiorite near the Post-Betze mine in Boulder Valley indicate that the hydraulic conductivity of intrusive rocks is approximately 3 to 5 feet/day where the rocks are highly fractured (Maurer et al. 1996). However, where fracturing is less extensive, intrusive rocks generally have very poor permeability and impede the movement of ground water (Plume 1995).

Older Basin-Fill Deposits

The older basin-fill hydrolithologic unit consists of semiconsolidated deposits of conglomerate, sandstone, siltstone, claystone, freshwater limestone, evaporite, and interbedded volcanic rocks (Plume 1996). The deposits accumulated in basins that predated the basins that began development during the earliest stages of basin and range extension. As a result, older basin-fill deposits constitute much of the valley fill in present-day basins.

Only relatively small areas of older basin-fill deposits have been mapped in Crescent Valley - near Horse Canyon on the flanks of the Toiyabe Range and in the Shoshone Range north of Rocky Pass. Older basin fill is inferred to underlie younger basin fill throughout the valley, although the depth of the contact between these two units is not well delineated. The total thickness of all basin-fill deposits in the deepest part of the Crescent Valley structural basin is thought to be approximately 10,000 feet (Gilluly et al. 1965).

Fine-grained valley floor deposits overlying the older alluvium on the eastern side of the valley appear to act as an upward barrier (i.e., confining layer) to ground water flowing underneath the valley floor. The result is an artesian aquifer with a water level (potentiometric surface) that is higher than the ground surface in some portions of the basin east and northeast of the Proposed Action. When a well is drilled into the older alluvium in these areas, the higher hydraulic head may cause the well to flow freely to the surface without being pumped. Several flowing wells are identified in this area on USGS topographic maps.

Most of the wells in Crescent Valley are completed in alluvial fans or in sand and gravel layers within the upper 500 feet of basin-fill material. Many of these wells are probably completed in both younger and older basin-fill deposits. Where older basin fill and younger basin fill have been distinguished as separate hydrolithologic units, the hydraulic conductivity of older basin-fill deposits is reported to range between 0.1 and 10 feet/day (WMC 1995a, Maurer et al. 1996).

Younger Basin-Fill Deposits

The younger sediments that form the alluvial fans at the margins of the valley consist primarily of coarse-grained poorly sorted materials including silt, sand, gravel, cobbles, and boulders. The larger more extensive fans on the western side of the valley may reach thicknesses of 700 to 800 feet with smaller fans on the eastern side reaching thicknesses of 400 to 500 feet. Streambed sediments consisting of a wide variety of material (from boulders to silt and clay) are often deposited within these fans. Younger alluvium, composed of sand, silt, and clay deposits at the toes of many of the alluvial fans, occurs mainly toward the center of the valley. This forms discontinuous beds of clay, silt, sand, or gravel.

Ground water flow in the younger basin-fill deposits is generally from the topographically elevated margins of

the basin toward the valley floor. Because of the contrast in hydraulic conductivities between coarse-grained alluvial fan material and finer grained material, ground water sometimes discharges at the toes of alluvial fans in the form of springs and seeps. The springs are more common along the eastern side of the valley.

Hydraulic conductivities and transmissivities in the younger basin-fill are highly dependent on grain size, degree of sorting (uniformity of grain sizes), and the amount of cementation of the grains. Conductivities are relatively high in well-sorted, coarse-grained sediments near the alluvium/bedrock contact. Values of transmissivity calculated from pump-test data reported by WMC (1992b) range from 9,000 to 12,000 ft^2/day. Hydrologic properties of younger basin-fill materials were measured at four locations in the central part of Crescent Valley around 1950 by the USGS and also in the vicinity of the Cortez mine by several private consulting firms, as described in the *South Pipeline Project Ground Water Flow Modeling report* (Geomega 1998a). The aquifer tests conducted by the USGS indicate that transmissivity of alluvial-fan deposits ranges from 4,000 to 8,200 square feet/day and that the transmissivity of finer grained deposits in the northern part of the valley floor is about 870 square feet/day. Pumping tests conducted at the Cortez Mine site indicate that the hydraulic conductivity of alluvial-fan deposits is in the range of 5 to 45 feet/day, whereas the valley-floor deposits have a much wider range of 4 to 2,230 feet/day. The larger hydraulic conductivity values for the valley-floor deposits at the Cortez mine site occur in a depositional feature identified as a paleochannel (Dames & Moore 1994). Estimated values for the storage coefficient of alluvial deposits range from 0.003 to 0.05 (SHB AGRA 1993).

Since younger valley-fill deposits constitute the major aquifers in the Great Basin, the hydraulic properties of deposits similar to those composing the younger basin-fill hydrolithologic unit have been extensively measured and reported (Bredehoeft 1963; Bunch and Harrill 1984; Plume 1995, 1996; Prudic and Herman 1996; Maurer et al. 1996; Thomas et al. 1989; Winograd and Thordarson 1975). In general, hydraulic conductivity values of younger basin-fill deposits range from 0.5 to about 2,000 feet/day, with many values between about 3 and 74 feet/day. Specific yield of younger basin-fill deposits ranges from about six percent for fine-grained deposits to nearly 30 percent for coarse-grained deposits. Values of 10 to 15 percent are typically used in ground water flow models for other valleys in the Great Basin (Thomas et al. 1989).

Playa Deposits

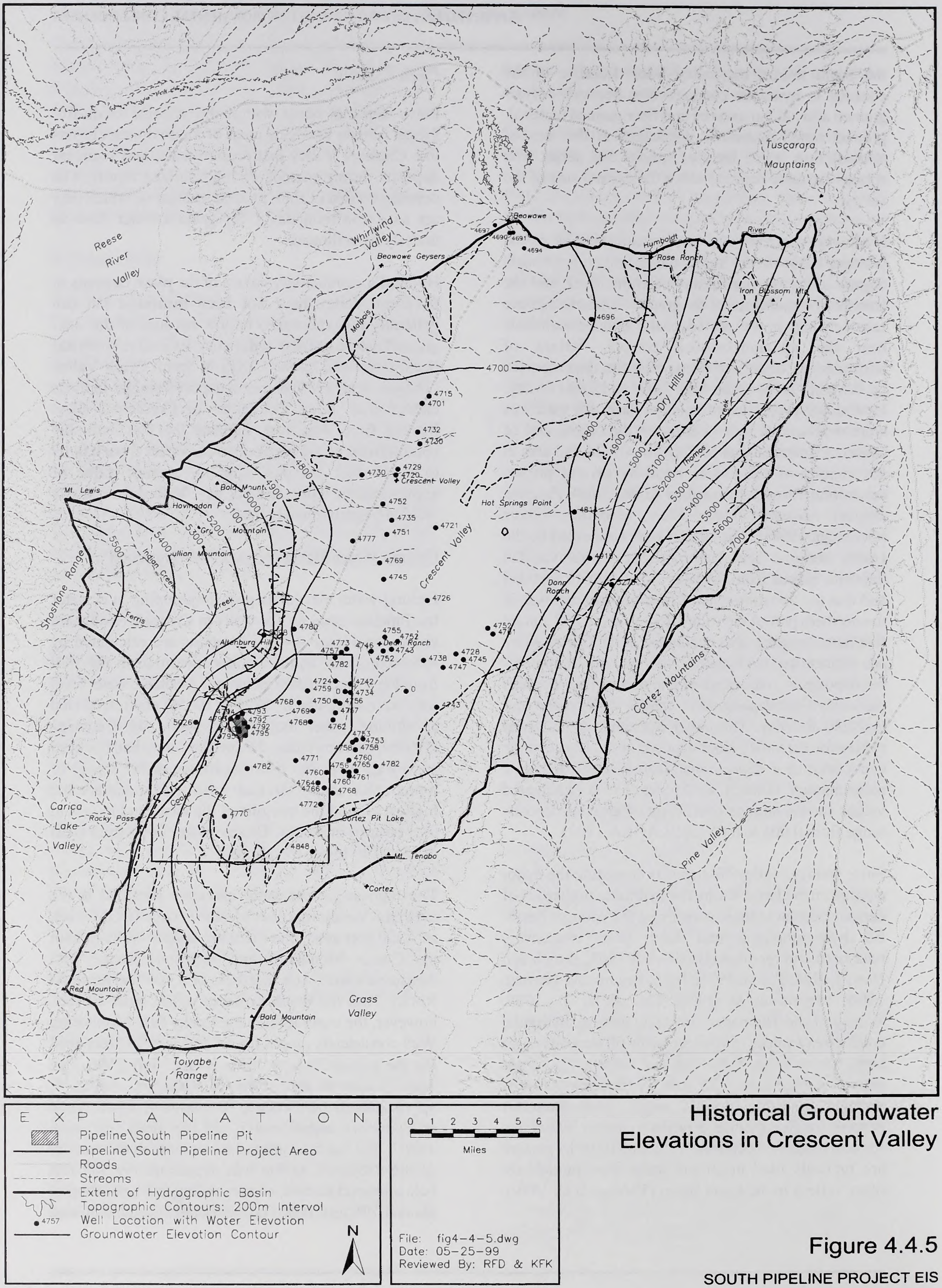
Playa deposits occur within the younger basin-fill. Playas form in low-lying areas of intermountain basins like Crescent Valley that receive water and sediment deposits during periods of high surface runoff. The deposits consist of finer grained sediments, which may act as a confining layer for ground water flow in underlying sediments.

Hydraulic conductivity values of the playa deposits in Crescent Valley have not been measured but can generally be expected to be low because of the fine-grained nature of these sediments. Extensive work has been performed by the USGS in Smith Creek Valley (Thomas et al. 1989) on playa deposits similar to those encountered along the center of Crescent Valley. Results from this work indicate that the hydraulic conductivity of the playa deposits varies from 0.0009 to 0.017 feet per day, with an average value of approximately 0.006 feet per day. Values for specific yield are approximately 0.06.

Ground Water Elevations and Flow Direction

Ground water elevations prior to pumping to dewater the Pipeline open pit for wells in Crescent Valley are shown on Figure 4.4.5. Elevations are calculated by subtracting the depth to water measured in the well from the surface datum elevation. Available water level data were compiled by WMC (1995a) and interpreted as ground water elevation contours by Geomega (1998b). In many cases, the surface datum had not been surveyed, so it was estimated from driller's logs or topographic maps. Ground water elevations are the highest around the margins of the basin and lowest in the center of the valley. Ground water flows from areas of higher to lower elevations.

The highest ground water elevation recorded in the Crescent Valley was near Mount Tenabo (CGM 130), at 7,300 feet amsl, and there are several wells in both the Cortez Mountains and Shoshone Range with measured water levels in excess of 5,100 feet amsl. At Rocky Pass the depth to water is less than 10 feet, however, the water level in the Rocky Pass Monitoring Well consistently ranges from 5,002 to 5,007 feet amsl for the period January 1996 through July 1998. The water table at the town of Crescent Valley is approximately 60 feet deep (elevation 4,730 feet) and at Beowawe approximately 20 feet deep (elevation 4,691). The baseline ground water table in the vicinity of the Proposed Action was approximately 300 feet below ground surface, corresponding to an elevation of about 4,795 feet. Based on these contours, the indicated



Historical Groundwater Elevations in Crescent Valley

Figure 4.4.5

flow direction is easterly and southeasterly across the project site and, generally, northeasterly along the axis of the basin.

Ground water pumping to dewater the Pipeline open pit began in April 1996. Water levels measured in the Project area in December 1997 are shown as a contour map on Figure 4.4.6. The ground water elevation contours show an area of drawdown in the immediate area of the pit and extending to near the approximate boundaries of the Gold Acres Window. Mounds of higher ground water elevations are apparent in the areas of the active infiltration ponds.

Beginning in 1996 through early 1998 the water level in the Cortez Pit lake has declined approximately 25 feet. Water levels in the alluvial aquifer between the Pipeline open pit and the Cortez open pit lake have not changed to this degree (Brown and Caldwell 1998, 1999). The contributing factors in water level decline at the Cortez Pit Lake are the subject of an on-going investigation by CGM.

Ground Water Recharge

Surface water entering the ground water system is referred to as recharge. Ground water recharge to Crescent Valley occurs primarily from direct infiltration of precipitation and runoff. Seepage from streams that cross the alluvial fans around the margins of the basin is the primary route for recharge.

At higher elevations, seepage from streams percolates into the bedrock and into the thin veneer of alluvium that overlies the bedrock. Since ground water movement in the bedrock is probably restricted in most areas by geologic structures such as faults or contacts, much of the recharge moves downslope in the alluvium as shallow ground water flow and then either percolates directly into the alluvial fans or appears as springs.

Following periods of high precipitation, when flow rates in the streams are greatest, surface flow extends further onto the piedmont slopes and the alluvial fans. Only during times of exceptionally high flow does the surface flow reach the lower slopes of the fans and the valley floor. Runoff is likely to be greater from the Cortez Mountains, where the alluvial fans are steeper. Surface flow therefore reaches the valley floor more frequently on the eastern side of the basin.

Maxey and Eakin (1949) empirically derived a method to estimate the amount of recharge to a ground water basin utilizing the assumption of zones of equal precipitation at equal elevations (Hardman 1936). The Maxey-Eakin method assumes that recharge becomes negligible in elevation zones where the annual average precipitation is less than 8 inches. Observations and monitoring in other basins throughout Nevada have tended to support this method (Watson et al. 1976 and Avon and Durbin 1994). Recharge rates for the entire Crescent Valley basin have been estimated based upon these methods (Geomega 1998b) and are summarized in Table 4.4.1. The total recharge rate to the Crescent Valley basin from precipitation has been calculated to be 26,317 acre-feet per year.

Additional recharge to ground water in Crescent Valley occurs from minor surface flow and ground water underflow from Carico Lake Valley through Rocky Pass. The combination of underflow and surface infiltration of Cooks Creek at Rocky Pass is estimated to be between 100 and 400 acre-feet/year (Zones 1961; WMC 1995a).

Ground Water Discharge

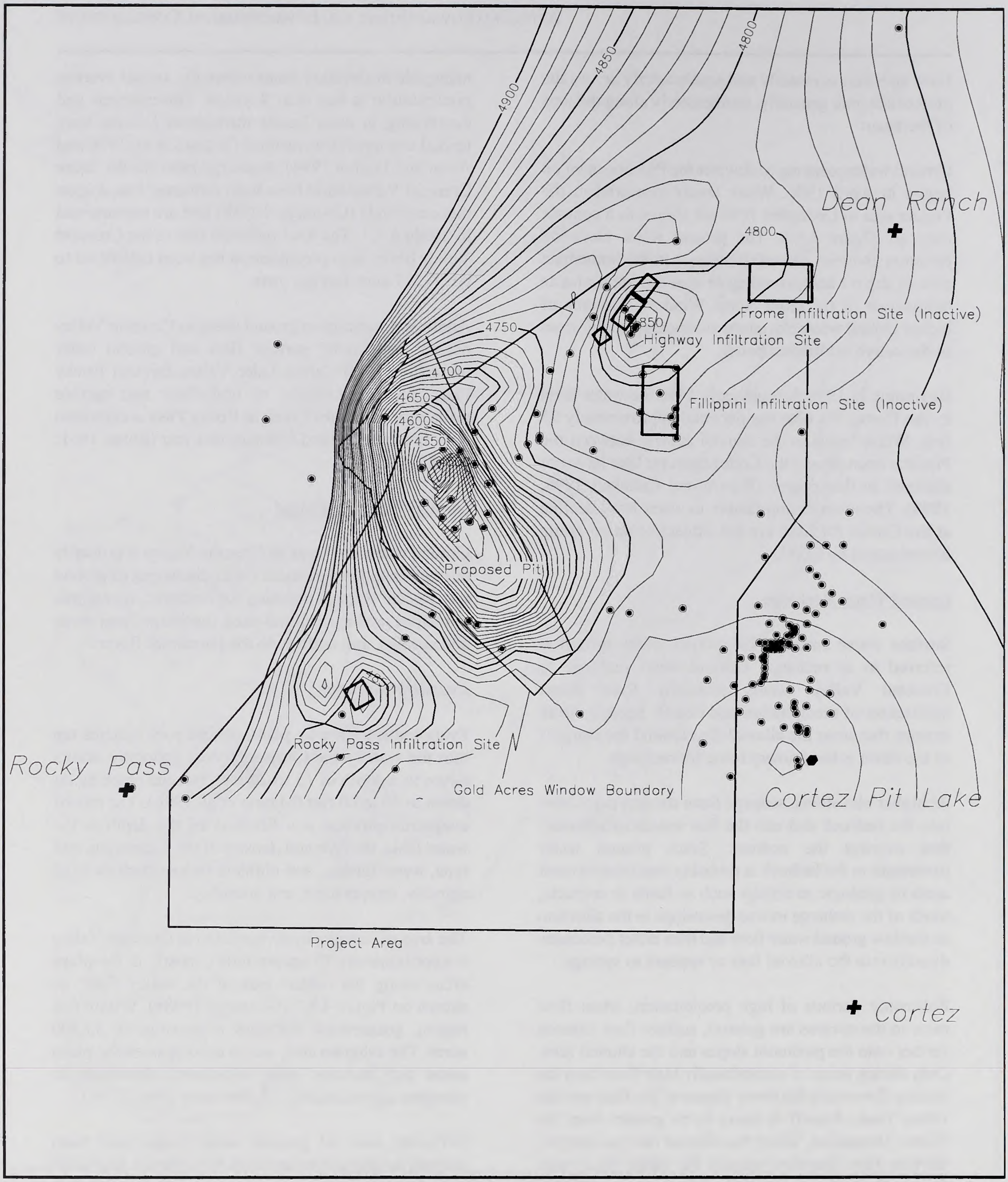
Ground water discharge in Crescent Valley is primarily through evapotranspiration. Other discharges of ground water occur through pumping for domestic, municipal, industrial, and agricultural uses, discharge from seeps and springs, and outflow to the Humboldt River.

Evapotranspiration

Evapotranspiration by plants whose root systems tap into the water table (phreatophytes) generally occurs down to a depth of 15 to 20 feet, but can reach as far down as 40 to 60 feet (Maurer et al. 1996). The rate of evapotranspiration is a function of the depth to the water table, the type and density of the vegetation, soil type, water quality, and climatic factors such as wind velocity, temperature, and humidity.

The area of phreatophyte vegetation in Crescent Valley is approximately 75 square miles, mostly in the playa areas along the central part of the valley floor, as shown on Figure 4.4.7 (Geomega 1998b). Within this region, greasewood occupies approximately 33,300 acres. The saltgrass area, which encompasses the playa areas and includes other associated phreatophytes occupies approximately 14,000 acres (Zones 1961).

Differing rates of ground water usage have been defined for phreatophytes in the Great Basin. Estimated annual evapotranspiration rates in greasewood areas range from 0.15 to 1.45 feet/year (Zones 1961; Robinson and Waananen 1970). Annual evapotranspiration rates in areas that are a mixture of grasses including saltgrass, rabbitbrush, and greasewood are estimated at 0.5 to 0.9 feet/year (Zones 1961; Plume 1995). In water-budget studies for Pine



E X P L A N A T I O N

- Pipeline\South Pipeline Pit
- Pipeline\South Pipeline Project Area
- Well Used for Contour Interpolation
- Cortez Pit Lake
- Water Elevation Contour
  - 10-foot Interval
  - 50-foot Index Interval

0 1 2 3
Miles

N

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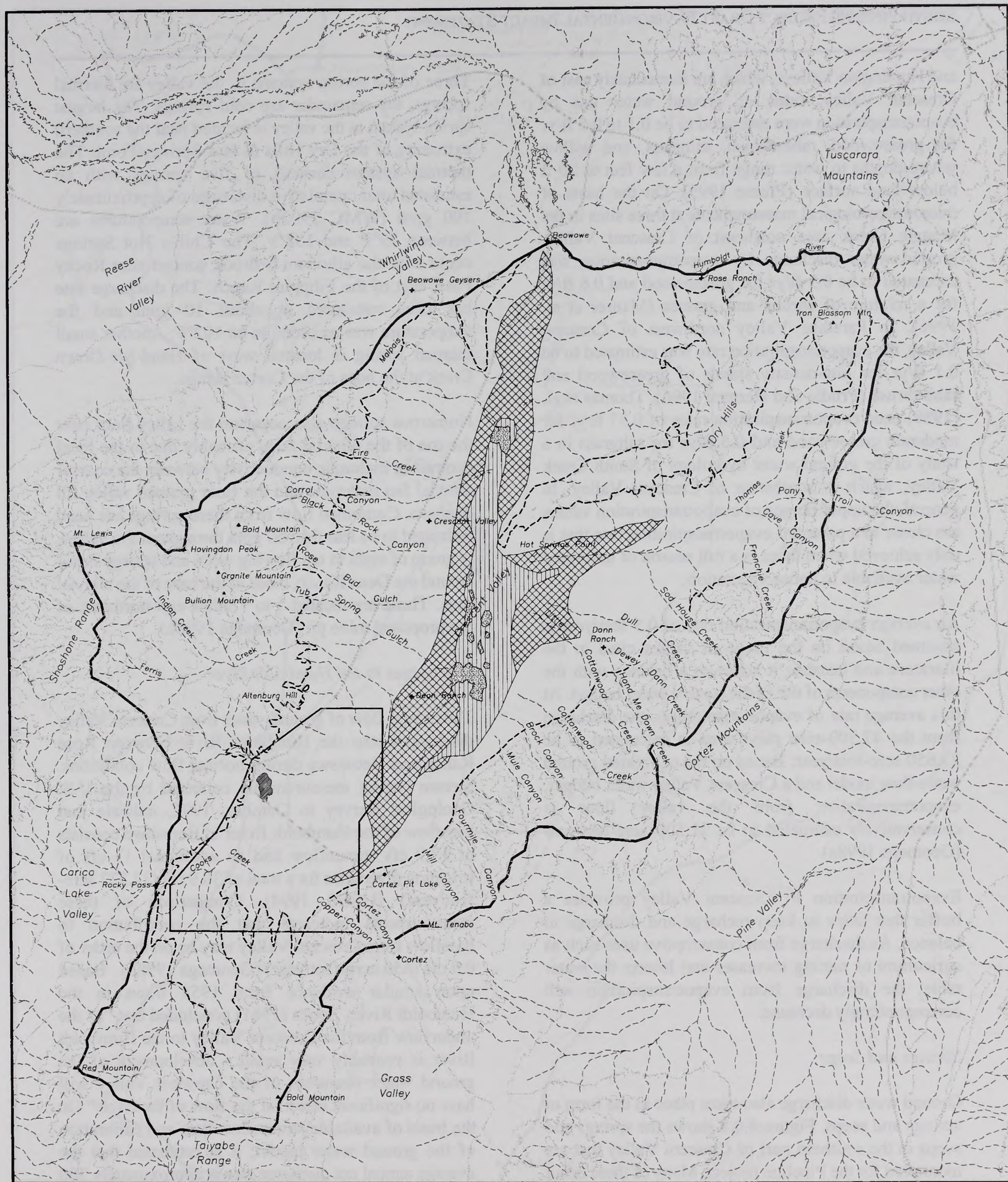
Water Levels on South Pipeline Project Area, Measured December, 1997

Figure 4.4.6



EXPLANATION

- Pipeline\South Pipeline Pit
- Pipeline\South Pipeline Project Area
- Roads
- Extent of Hydrographic Basin
- Topographic Contours: 200m Interval
- Playa
- Phreatophytes:
  - Greasewood
  - Saltgrass

N

0 1 2 3 4 5 Miles

Miles

Source: Zones 1961

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Distribution of Phreatophytes in Crescent Valley

Figure 4.4.7

SOUTH PIPELINE PROJECT EIS

and Huntington Valleys, which are immediately east of Crescent Valley, rates of ground water use by evapotranspiration were estimated to be 0.1 to 0.5 ft/yr for greasewood, rabbitbrush, saltgrass, and willow where depths to water range from a few feet to 20 ft below land surface (Plume 1995). On the basis of micrometeorological measurements at three sites in the Maggie Creek area northeast of Crescent Valley, ground water discharge by evapotranspiration was estimated to be 0.3 ft/yr for greasewood and 0.6 ft/yr for a mixture of shrubs and grasses (Maurer et al. 1996). In Paradise Valley northwest of Crescent Valley, the evapotranspiration rate was estimated to be 0.1 ft/yr for low-density stands of greasewood and rabbitbrush (Prudic and Herman 1996). Thomas et al. (1989) used evapotranspiration rates of 0.37 ft/yr for moderate greasewood and 0.5 ft/yr for saltgrass in a study of the ground water hydrology of Smith Creek Valley, which is southwest of Crescent Valley. In general, the upper ranges of evapotranspiration values are closer to a potential evapotranspiration rate that is only achieved when there is a full season of unlimited water available to dense vegetation.

An average evapotranspiration rate of 0.5 feet/year is assumed based on the range of values cited in the literature and because it achieves a balance with the other components of the of the basin's water budget. At this average rate of evapotranspiration, the discharge from the 47,300-acre playa area is calculated to be 23,650 acre-feet/year. Based on the calibrated ground water flow model and a Crescent Valley water budget, evapotranspiration from the valley floor is conservatively estimated to be 21,500 acre-feet/year (Geomega 1998a).

Evapotranspiration in Crescent Valley provides a buffer that helps to keep recharge and discharge in balance. As discharge from consumptive uses such as agriculture or mining increases and lowers the water table, the discharge from evapotranspiration will correspondingly decrease.

Springs and Seeps

Ground water discharge also takes place in the form of springs and seeps. Figure 4.4.8 shows the springs and seeps in the southern part of Crescent Valley that are monitored for the Pipeline project. Many of these occur within bedrock terrain around the margins of the valley, often in response to localized ground water movement within fractured rock or perched aquifers. It is estimated that the total combined discharge rate of seeps and springs in Crescent Valley is 250 to 300 acre-feet/year (WMC 1992b).

Three of the spring systems in the valley are thermal springs, the remainder are cold springs. The largest spring system in the valley is located near the southern extremity of the Dry Hills at Hot Springs Point. The thermal system consists of five springs with an estimated total cumulative discharge of approximately 100 gpm (WMC 1992b). Water temperatures are between 79°F and 138°F. The Chillis Hot Springs occur near the alluvium-bedrock contact near Rocky Pass, east of the Filippini Ranch. The discharge rate has been measured at about 10 gpm and the temperature was recorded to be 102°F. Another small thermal spring is located west of Hand-Me-Down Creek at the base of the Cortez Range.

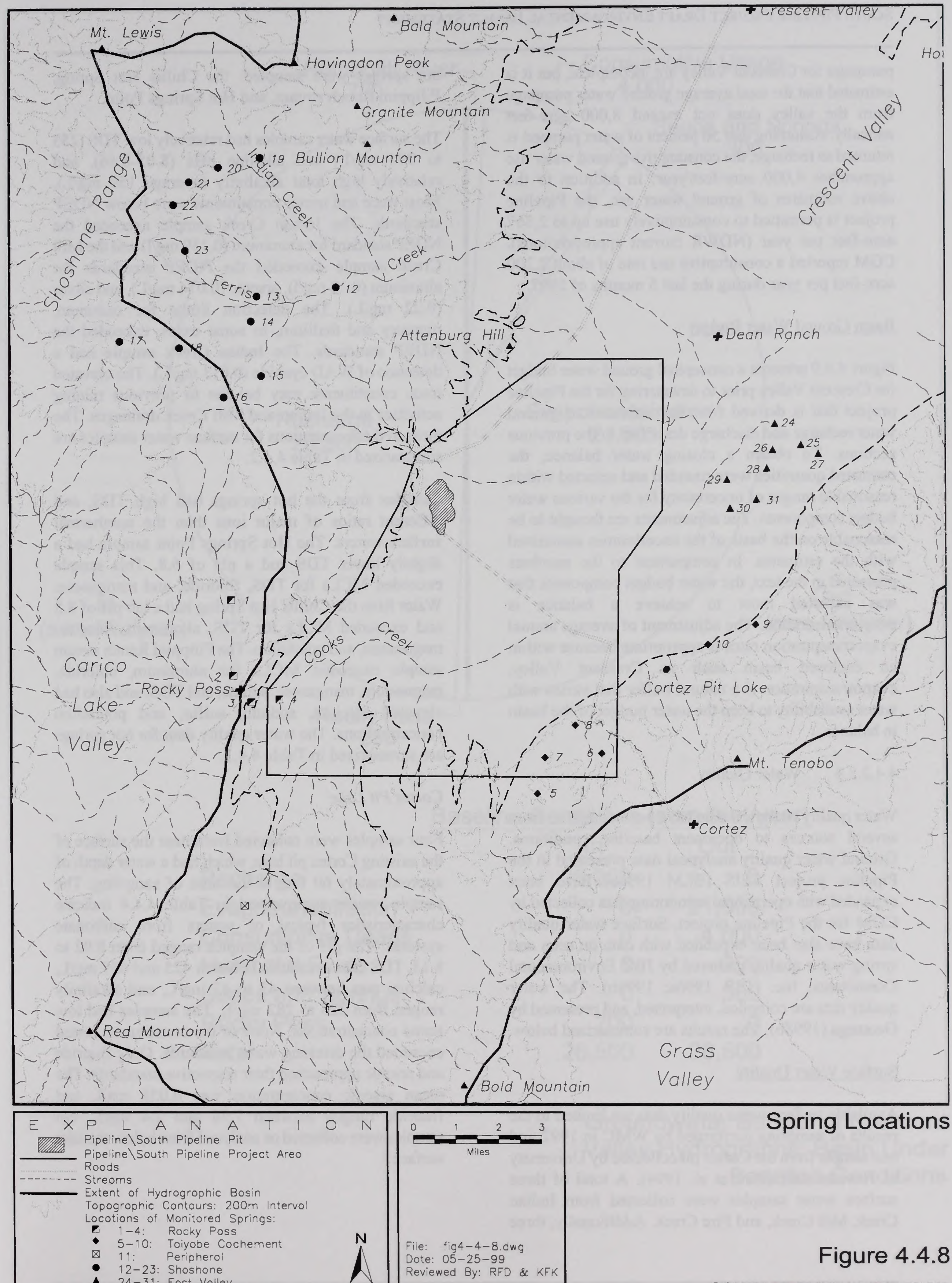
Numerous springs also occur on the valley floor near the toe of the alluvial fans, probably due to the local contrast in hydraulic conductivity between the coarser alluvial fan materials and the finer grained valley fill deposits. Combined flow from these springs has been estimated to be less than 50 gpm throughout the valley. A group of eight to ten flowing wells and springs occur around the Dean Ranch, close to the base of the alluvial fans. These are located 5 to 7 miles east-northeast of the proposed mine pit (Geomega 1998b).

Discharges to the Humboldt River

The natural flow of ground water from Crescent Valley discharges into the Humboldt River between Rose Ranch and Beowawe during normal flow conditions. Stream gaging measurements collected by the U.S. Geological Survey in October, 1992, indicate that baseflow of the Humboldt River at Beowawe consists of 17.9 cfs streamflow and an additional 13 cfs of irrigation diversions for a total of 30.9 cfs (22,327 acre-feet/year) (USGS 1994). Comparison of these measurements indicates that the contribution to baseflow from Crescent Valley may be on the order of 0.9 cfs (650 acre-feet/year) (Geomega 1998b). Based upon similar evidence from 1958 flows in the Humboldt River, Zones (1961) concluded that "as the underflow from the Crescent Valley to the Humboldt River is probably very small... development of the ground water resources of the Crescent Valley will have no significant effect on the flow of the river." On the basis of available streamflow data and calibration of the ground water model, it is estimated that the average annual net discharge rate is approximately 700 to 750 acre-feet per year (Geomega 1998a, 1998b).

Ground Water Use

Ground water discharge also takes place through well pumpage for domestic, industrial, municipal, and agricultural purposes. Records on ground water



Spring Locations

Figure 4.4.8

SOUTH PIPELINE PROJECT EIS

pumpage for Crescent Valley are incomplete, but it is estimated that the total average ground water pumpage from the valley does not exceed 8,000 acre-feet annually. Assuming that 50 percent of water pumped is returned as recharge, the consumptive ground water use approaches 4,000 acre-feet/year. In addition to the above estimates of ground water use, the Pipeline project is permitted to consumptively use up to 2,367 acre-feet per year (NDWR current appropriations). CGM reported a consumptive use rate of about 2,200 acre-feet per year during the last 6 months of 1997.

Basin Ground Water Budget

Figure 4.4.9 presents a conceptual ground water budget for Crescent Valley prior to dewatering for the Pipeline project that is derived from the estimates of ground water recharge and discharge described in the previous sections. To obtain a closing water balance, the estimated quantities were rounded and selected within reasonable ranges of uncertainty for the various water budget components. The adjustments are thought to be reasonable on the basis of the uncertainties associated with the estimates. In comparison to the numbers presented in the text, the water budget component that was adjusted most to achieve a balance is evapotranspiration. The adjustment of average annual evapotranspiration rates is appropriate because within an enclosed basin such as Crescent Valley, evapotranspiration is a natural buffer that varies with water availability to keep the water budget of the basin in balance.

4.4.2.2.4 Water Quality

Water quality analytical data have been compiled from several sources to document baseline conditions. Ground water quality analytical data presented in the Pipeline project FEIS (BLM 1996a) have been expanded with operational monitoring data collected by CGM for the Pipeline project. Surface water quality data have also been expanded with data on seep and spring water quality gathered by JBR Environmental Consultants, Inc. (JBR 1996a; 1996b). The water quality data are compiled, interpreted, and presented by Geomega (1998b). The results are summarized below.

Surface Water Quality

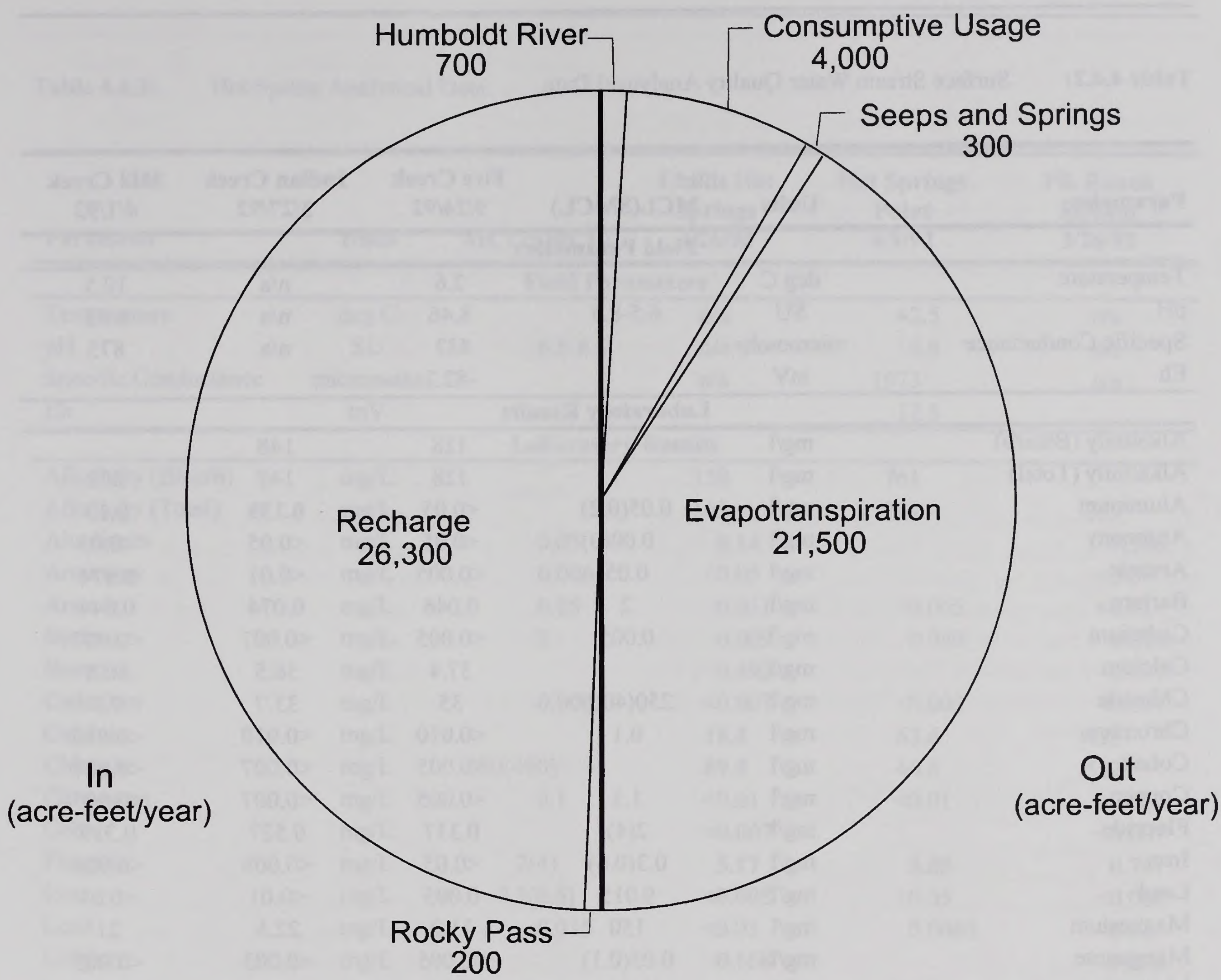
Available surface water quality data are limited to the results of sampling performed by WMC in 1992 and one sample from the Cortez pit collected by University of Nevada staff (Bird et al. 1994). A total of three surface water samples were collected from Indian Creek, Mill Creek, and Fire Creek. Additionally, three hot springs were sampled: the Chillis Hot Spring, Filippini Ranch stream, and Hot Springs Point.

The surface water samples had relatively low TDS (253 to 394 mg/L) and alkaline pHs (8.05-8.46), and relatively high total alkalinity (average 159 mg/L). Most trace and minor constituents were below NDEP standards. The Indian Creek sample exceeded the NDEP standard for aluminum (0.139 mg/l) and the Mill Creek sample exceeded the NDEP standards for aluminum (0.13 mg/l), arsenic (0.074 mg/L), and silver (0.22 mg/L). The detection limits for cadmium, mercury and thallium, in some cases, exceeded the NDEP standards. The Indian Creek sample had a detection of WAD cyanide (0.013 mg/L). The elevated trace constituents may be due to previous mining activities in the Indian and Mill Creek drainages. The measured concentrations for surface water samples are summarized in Table 4.4.2.

Samples from the hot springs had high TDS, and different ratios of major ions than the nonthermal surface waters. The Hot Springs Point sample had a slightly lower TDS and a pH of 6.8. This sample exceeded MCLs for TDS, fluoride, and manganese. Water from the Chillis Hot Spring had a lab pH of 8.5 and exceeded MCLs for TDS, aluminum, fluoride, magnesium, and potassium. The Filippini Ranch stream sample exceeded MCLs for aluminum, chloride, magnesium, manganese, sulfate, and TDS, and also had elevated calcium, sodium, sulfur, and potassium concentrations. The water quality data for hot springs are summarized in Table 4.4.3.

Cortez Pit Lake

Four samples were collected from near the surface of the existing Cortez pit lake, which had a water depth of approximately 60 feet at the time of sampling. The sample results summarized in Table 4.4.4 indicate characteristics typical of waters from carbonate systems. The pH of the samples ranged from 8.02 to 8.13, TDS concentrations between 425 and 438 mg/L, calcium was between 43 to 45 mg/L, and alkalinity ranged from 225 to 282 mg/L. The samples had low metal concentrations. None of the constituents tested exceeded the drinking water standards. Only fluoride and arsenic approached their respective standards. The mean arsenic concentration was 0.038 mg/L and fluoride ranged between 1.76 and 2.4 mg/L. No samples were collected or analyzed from below the lake surface.



Baseline Conditions (acre-feet/year)

	In	Out
Recharge	26,300	0
Evapotranspiration	0	21,500
Consumptive Usage	0	4,000
Humboldt River	0	700
Seeps and Springs	0	300
Rocky Pass	200	0
Total	26,500	26,500

EXPLANATION

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Groundwater Budget of Crescent Valley Hydrographic Basin Under Baseline Conditions

Figure 4.4.9

SOUTH PIPELINE PROJECT EIS

Table 4.4.2: Surface Stream Water Quality Analytical Data

Parameter	Units	MCL(SMCL)	Fire Creek 9/24/92	Indian Creek 3/27/92	Mill Creek 4/1/92
Field Parameters					
Temperature	deg C		2.6	n/a	10.5
pH	SU	6.5-8.5	8.46	n/a	8.05
Specific Conductance	micromohs		433	n/a	875
Eh	mV		-82.2		
Laboratory Results					
Alkalinity (Bicarb)	mg/l		128	148	
Alkalinity (Total)	mg/l		128	148	202
Aluminum	mg/l	0.05(0.2)	<0.05	**0.139**	**0.13**
Antimony	mg/l	0.006	<0.05	<0.05	<0.05
Arsenic	mg/l	0.05	<0.005	<0.01	**0.074**
Barium	mg/l	2	0.046	0.074	0.044
Cadmium	mg/l	0.005	<0.005	<0.007	<0.007
Calcium	mg/l		37.4	56.5	80.5
Chloride	mg/l	250(400)	35	33.7	9.7
Chromium	mg/l	0.1	<0.010	<0.010	<0.010
Cobalt	mg/l		<0.005	<0.007	<0.007
Copper	mg/l	1.3	<0.005	<0.007	<0.007
Fluoride	mg/l	2(4)	0.337	0.527	0.319
Iron	mg/l	0.3(0.6)	<0.05	<0.008	<0.006
Lead	mg/l	0.015	0.005	<0.01	<0.01
Magnesium	mg/l	150	11.2	22.6	21
Manganese	mg/l	0.05(0.1)	<0.005	<0.003	<0.003
Mercury	mg/l	0.002	<0.0005	<0.01	<0.005
Molybdenum	mg/l		<0.01	<0.015	<0.015
Nickel	mg/l	0.1		<0.02	0.02
Nitrate	mg/l	10	<1.0	<0.1	1.1
pH	SU	6.5-8.5	8.24	8.02	8.28
Potassium	mg/l		4.3	3.5	3.11
Selenium	mg/l	0.05	<0.005	0.007	<0.005
Silica	mg/l		20.1	13.2	9.22
Silver	mg/l	0.1	<0.01	<0.02	**0.22**
Sodium	mg/l		36.9	43.6	21.7
Sulfate	mg/l	250(500)	28.1	106	92.8
TDS	mg/l	500(1000)	253	394	380
Thallium	mg/l	0.002	<0.1	<0.15	<0.15
WAD Cyanide	mg/l	0.2	<0.005	0.013	<0.005
Zinc	mg/l	5	<0.005	<0.005	0.014

Source: BLM, 1996.
Exceedences of enforceable drinking water standards are shown in bold-face type.

Table 4.4.3: Hot Spring Analytical Data

Parameter	Units	MCL(SMCL)	Chillis Hot Springs 3/26/92	Hot Springs Point 9/9/92	Fil. Ranch Stream 3/26/92
Field Parameters					
Temperature	deg C		n/a	42.5	n/a
pH	SU	6.5-8.5	n/a	6.8	n/a
Specific Conductance	micromohs		n/a	1973	n/a
Eh	mV			12.5	
Laboratory Results					
Alkalinity (Bicarb)	mg/L		158	761	
Alkalinity (Total)	mg/L		163	761	359
Aluminum	mg/L	0.05(0.	**0.14**		**0.136**
Antimony	mg/L	0.006	<0.05		<0.05
Arsenic	mg/L	0.05	0.011	<0.005	<0.01
Barium	mg/L	2	0.009	0.089	0.038
Boron	mg/L		0.492		0.797
Cadmium	mg/L	0.005	<0.007	<0.005	<0.007
Calcium	mg/L		18.4	63.6	455
Chloride	mg/L	250(400)	89.8	46.6	**512**
Chromium	mg/L	0.1	<0.01	<0.01	<0.01
Cobalt	mg/L		<0.007		<0.007
Fluoride	mg/L	2(4)	**5.17**	**5.85**	0.741
Iron	mg/L	0.3(0.6)	<0.008	<0.05	<0.008
Lead	mg/L	0.015	<0.01	0.0005	<0.01
Lithium	mg/L		0.168		0.076
Magnesium	mg/L	150	4.72	34.8	**162**
Manganese	mg/L	0.05(0.1)	0.012	**0.06**	**0.577**
Mercury	mg/L	0.002	<0.01	0.0005	<0.01
Molybdenum	mg/L		0.025		0.05
Nickel	mg/L	0.1	<0.02		0.03
Nitrate	mg/L	10	<0.1	<1	<0.1
pH	SU	6.5-8.5	8.52	6.86	7.55
Palladium	mg/L		<0.05		<0.05
Platinum	mg/L		<0.12		<0.12
Potassium	mg/L		2.24	59	29.9
Selenium	mg/L	0.05	<0.05	<0.01	0.022
Silica	mg/L		22.1		12.8
Silver	mg/L	0.1	<0.02	<0.01	0.071
Sodium	mg/L		188	259	341
Sulfate	mg/L	250(500)	106	119	**1440**
Sulfur	mg/L		54		516
TDS	mg/L	500(1000)	**3486**	**1080**	**3433**
Tellurium	mg/L		<0.075		<0.075
Tin	mg/L		<0.130		<0.13
Thallium	mg/L	0.002	<0.150		<0.15
WAD Cyanide	mg/L	0.2	<0.005	<0.005	<0.005

(Continued on next page)

Parameter	Units	MCL(SMCL)	Chillis Hot Springs 3/26/92	Hot Springs Point 9/9/92	Fil. Ranch Stream 3/26/92
Titanium	mg/L		<0.001		<0.001
Tungsten	mg/L		<0.040		<0.040
Vanadium	mg/L		<0.007		<0.007
Zinc	mg/L	5	<0.005	0.013	0.007

Source: BLM, 1996.
Exceedences of enforceable drinking water standards are shown in bold-face type.

Seeps and Springs

The locations of the sampled seeps and springs are indicated in Figure 4.4.8. Twenty-four springs have been designated for quarterly monitoring and seven have been designated for semiannual monitoring. The springs are monitored for flow rate, conductivity, pH, temperature, and dissolved oxygen. Monitoring data are included in Geomega (1998b). The springs are divided into five groups:

- Rocky Pass group (four springs);
- Toiyabe Catchment group (six springs);
- Shoshone group (12 springs);
- East Valley group (eight springs); and
- Peripheral Area group (one spring).

Ground Water Quality

Alluvial Aquifer

Characterization of the alluvial aquifer water quality of Crescent Valley is based on samples from 48 sites including CGM monitoring wells and regional water wells. The baseline characterization is based on samples from wells during the first quarter of 1992 through the second quarter of 1997. The minimum, maximum, and average constituent concentrations from the pre-dewatering and infiltration time period are summarized in Table 4.4.5. Sampling locations and dates are shown in Geomega (1998b).

The alluvial water quality is generally good, meeting most of the primary and secondary drinking water standards, and is suitable for mining, irrigation, and stock uses. Dominant cations are calcium, magnesium, and sodium. Dominant anions are chloride, sulfate and bicarbonate.

The average alluvial aquifer constituent concentrations do not exceed the relevant Nevada water quality standards with the exception of manganese (0.082 mg/L), which exceeds the non-enforceable secondary standard of 0.05 mg/L. The maximum concentration in an alluvial sample was above the drinking water standard for arsenic, chloride, fluoride, TDS, iron, manganese, mercury, thallium, and pH. Individual sample results that exceed standards are listed on Table 4.4.6.

Bedrock Aquifer

Characterization of the bedrock aquifer water quality is based on samples from 32 sites. The bedrock ground water samples were all taken from monitoring or dewatering wells in or near the Project area, since bedrock water supply wells are not common in Crescent Valley. The baseline characterization is based on wells that were sampled from the first quarter of 1992 through the second quarter of 1997. The minimum, maximum, and average constituent concentrations are summarized in Table 4.4.7. Sampling locations and dates are shown in Geomega (1998b).

The bedrock water quality is generally similar to the alluvial aquifer, but with higher concentrations of mineral constituents. The average concentrations meet the primary standards for drinking water, and the water quality is mostly suitable for mining, irrigation, and stock uses. Dominant cations are calcium, magnesium, and sodium. Dominant anions are chloride, sulfate and bicarbonate.

The average bedrock aquifer results meet drinking water quality criteria, except for exceeding the secondary drinking water standards for TDS, fluoride, iron, and manganese. The average concentrations of all bedrock aquifer constituents were less than the primary drinking water standards, with the exception of cadmium. Maximum concentrations of numerous constituents from bedrock wells exceeded the relevant drinking water standards. Individual exceedences for bedrock wells are listed in Table 4.4.8. These

Table 4.4.4: Cortez Pit Lake Water Quality Analytical Data

Parameter	Units	MCL(SMCL)	Cortez Pit Bird, et al.[1] 6/30/93	Cortez Pit Middle[2] 6/15/92	Cortez Pit East End[2] 6/15/92	Cortez Pit West End[2] 6/15/92
Field Parameters						
Temperature	deg C		n/a	n/a	n/a	n/a
pH	SU	6.5-8.5	n/a	n/a	n/a	n/a
Specific Conductance	micromohs		n/a	n/a	n/a	n/a
Eh	mV					
Laboratory Results						
Alkalinity (Bicarb)	mg/l		282.3	228	225	225
Alkalinity (Total)	mg/l			228	225	225
Aluminum	mg/l	0.05(0.2)	<0.02			
Antimony	mg/l	0.006				
Arsenic	mg/l	0.05	0.0383	0.037	0.038	0.04
Barium	mg/l	2	0.0603	0.06	0.061	0.06
Beryllium	mg/l					
Cadmium	mg/l	0.005		<0.007	<0.007	<0.007
Calcium	mg/l		45.4	43.1	44.2	43.1
Chloride	mg/l	250(400)	24.2	27.9	24.8	26.9
Chromium	mg/l	0.1		<0.010	<0.010	<0.010
Cobalt	mg/l					
Copper	mg/l	1.3		<0.007	<0.007	<0.007
Fluoride	mg/l	2(4)	**2.4**	1.76	1.78	1.76
Iron	mg/l	0.3(0.6)	0.134	0.257	0.145	<0.050
Lead	mg/l	0.015	0.0043	0.006	<0.005	0.007
Magnesium	mg/l	150	18.1	17.7	18	17.7
Manganese	mg/l	0.05(0.1)	0.0017	<0.003	0.005	<0.003
Mercury	mg/l	0.002	0.00046	<0.0005	<0.0005	0.00138
Molybdenum	mg/l					
Nickel	mg/l	0.1				
Nitrate	mg/l	10	0.207	<1.0	<1.0	<1.0
pH	SU	6.5-8.5	8.07	8.07	8.02	8.13
Potassium	mg/l		11.7	11.4	11.3	11.1
Selenium	mg/l	0.05		<0.005	<0.005	<0.005
Silica	mg/l		34.43			
Silver	mg/l	0.1				
Sodium	mg/l		68.63	72.4	72.8	71.4
Sulfate	mg/l	250(500)	90.2	85.6	86.5	81.9
TDS	mg/l	500(1000)	432.3	438	434	425
Thallium	mg/l	0.002				
WAD Cyanide	mg/l	0.2		<0.005	<0.005	<0.005
Zinc	mg/l	5	0.002	<0.005	<0.005	0.006

[1] Bird *et al.*, 1994
[2] BLM, 1996
Exceedences of enforceable drinking water standards are shown in bold-face type.

Table 4.4.5: Alluvial Water Quality Statistical Summary

Parameter	MCL(SMCL)	Min	Max	Avg	Count
Alkalinity (Bicarb)		110	394	222	42
Alkalinity (Total)		110	394	237	66
Nitrate as Nitrogen	10	<1	4.85	0.48	69
Specific Conductance (field)		440	1277	724	24
Sulfate	250(500)	2.78	250	108	66
Temperature (field)		10.8	35.3	20.0	38
Aluminum	0.05(0.2)	<0.05	<0.05	0.025	13
Antimony	0.006	<0.006	<0.006	0.003	13
Arsenic	0.05	<0.05	**0.058**	0.010	82
Barium	2	0.005	0.153	0.053	82
Beryllium	0.004	<0.004	<0.004	0.002	13
Cadmium	0.005	<0.005	<0.01	0.003	82
Calcium		5.4	169	57.7	82
Chloride	250(400)	2	**265**	37	82
Chromium	0.1	<0.01	0.014	0.005	82
Cobalt		<0.005	<0.05	0.008	4
Copper	1.3	<0.01	0.124	0.006	82
Total Dissolved Solids	500(1000)	172	**914**	462	82
Fluoride	2(4)	<0.1	**3.36**	1.32	82
Iron	0.3(0.6)	<0.1	**5.4**	0.15	82
Lead	0.015	<0.01	0.012	0.003	82
Magnesium	150	0.098	62.2	18.2	82
Manganese	0.05(0.1)	<0.005	**0.962**	**0.082**	82
Mercury	0.002	<0.002	**0.0501**	0.001	82
Nickel	0.1	<0.04	<0.04	0.020	13
Nitrate	10	<0.1	0.5	0.112	13
Potassium		<5	21	11	82
Selenium	0.05	<0.005	<0.005	0.003	13
Silver	0.1	<0.01	<0.01	0.005	13
Sodium		31	141	77	82
Thallium	0.002	<0.002	**0.003**	0.001	13
Zinc	5	<0.02	0.469	0.029	82
WAD Cyanide	0.2	<0.01	<0.005	0.004	82
pH (field)	6.5-8.5	6.8	8.91	7.79	36
pH (laboratory)		7.13	9.09	7.77	82

Exceedences of enforceable drinking water standards are shown in bold-face type.

Table 4.4.6: Alluvial Monitoring Well MCL/SMCL Exceedences

Parameter	Well	Date	Result	MCL/SMCL
Arsenic	i-05	6/18/96	0.058	0.05
Iron	Rocky Pass	1/9/96	1.9	0.6
Iron	Rocky Pass	6/18/96	5.4	0.6
Manganese	EMA-11	8/14/96	0.104	0.1
Manganese	Rocky Pass	1/9/96	0.157	0.1
Manganese	IM-01	6/19/96	0.163	0.1
Manganese	AW-7	3/26/97	0.17	0.1
Manganese	IM-04	6/18/96	0.258	0.1
Manganese	PL-67	10/1/92	0.26	0.1
Manganese	BLM Windmill	9/13/94	0.285	0.1
Manganese	Rocky Pass	6/18/96	0.297	0.1
Manganese	I-01	6/19/96	0.301	0.1
Manganese	EMA-11	2/12/97	0.319	0.1
Manganese	EMA-13	2/13/97	0.414	0.1
Manganese	I-08	6/18/96	0.872	0.1
Manganese	IM-06	6/19/96	0.938	0.1
Manganese	I-09	6/18/96	0.962	0.1
Mercury	PL-67	10/1/92	0.0037	0.002
Mercury	Dean Ranch Well	9/8/92	0.0164	0.002
Mercury	Johnson Ranch	1/10/96	0.0262	0.002
Mercury	Cottonwood Field	1/10/96	0.0501	0.002
Thallium	EMA-15	2/13/97	0.003	0.002

exceedences in bedrock wells are apparently due to their proximity to the mineralized zone where elevated metal concentrations are expected.

Infiltration Areas

As of December 1997, infiltration of dewatering water from the Pipeline project was initiated in August 1996 at the Highway Infiltration Site, in December 1996 at the Filippini Infiltration Site, in June 1997 at the Rocky Pass Infiltration Site, and in September 1997 at the Frome Infiltration Site.

The baseline water quality analyses from the monitoring wells adjacent to the infiltration sites prior to the infiltration of water are in good agreement with other background alluvial ground water throughout Crescent Valley. The water was pH neutral and generally met drinking water standard with the exception of initial manganese concentrations that were probably elevated due to monitoring well development (Geomega 1998b). The TDS measured from these wells sampled prior to infiltration typically ranged between 400 and 600 mg/L.

The water quality of the infiltrating water is currently monitored by wells adjacent to each of the active infiltration areas. Monitoring wells IM-1 through IM-6 are located adjacent to the Highway Infiltration Site. Co-located with IM-3A and IM-5A are two deep wells (IM-3A and IM-5A) at greater depths in the alluvium. Monitoring wells IM-10 through IM-16 are located adjacent to the Filippini Infiltration Site. Monitoring wells IM-17 through IM-20 are located adjacent to the Rocky Pass Infiltration Site. Monitoring wells IM-21 through IM-27 are located adjacent to the Frome Infiltration Site.

Monitoring data from the Highway Infiltration Site provide the best indication of the transitory changes in water quality that have been observed in monitoring wells adjacent to the active infiltration sites because the Highway Site has been in operation for the longest period of time. Changes in water quality have been

Table 4.4.7: Bedrock Water Quality Statistical Summary

Parameter	MCL(SMCL)	Min	Max	Avg	Count
Alkalinity (Bicarb)		223	584	285	41
Alkalinity (Total)		186	584	284	77
Nitrate as Nitrogen	10	<1	4.71	0.82	50
Specific Conductance (field)		801	2280	956	18
Sulfate	250(500)	102	**564**	168	77
Temperature (field)		19.9	39.3	28.9	29
Aluminum	0.05(0.2)	<0.05	0.05	0.026	33
Antimony	0.006	<0.006	**0.013**	0.004	33
Arsenic	0.05	<0.01	**0.235**	0.023	85
Barium	2	0.01	0.22	0.06	85
Beryllium	0.004	<0.004	<0.004	0.002	33
Cadmium	0.005	<0.007	**0.326**	**0.006**	85
Calcium		42.9	140	63.1	85
Chloride	250(400)	15.3	**289**	41.0	84
Chromium	0.1	<0.01	0.051	0.007	85
Cobalt		<0.007	0.011	0.005	5
Copper	1.3	<0.01	**73.4**	0.87	85
Total Dissolved Solids	500(1000)	434	**1640**	**600**	83
Fluoride	2(4)	0.3	**3.6**	**2.8**	84
Iron	0.3(0.6)	<0.1	**159**	**1.99**	85
Lead	0.015	<0.01	**0.062**	0.004	85
Magnesium	150	16.5	55	24.7	84
Manganese	0.05(0.1)	<0.005	**2.32**	**0.092**	85
Mercury	0.002	<0.0005	**0.0052**	0.0004	85
Nickel	0.1	<0.04	<0.04	0.02	33
Nitrate	10	<0.1	4.2	0.22	33
Potassium		2.5	24.6	16.87	85
Selenium	0.05	<0.005	0.007	0.003	33
Silver	0.1	<0.01	<0.01	0.005	33
Sodium		10.1	296	107	85
Thallium	0.002	<0.002	**0.003**	0.0011	33
Zinc	5	<0.02	**35.1**	0.43	85
WAD Cyanide	0.2	<0.01	<0.005	0.0038	85
pH (field)	6.5-8.5	7.1	8.43	7.87	24
pH - Laboratory		7.2	8.67	7.74	84

Source: BLM, 1996; Cortez Gold Mines, 1997.
Exceedences of enforceable drinking water standards are shown in bold-face type.

Table 4.4.8: Bedrock Monitoring Well MCL/SMCL Exceedances

Parameter	Well	Date	Result	MCL/SMCL
Sulfate	OW-3A	9/13/94	548	500
Sulfate	OW-3S	1/11/97	560	500
Sulfate	OW-3S	1/11/96	560	500
Sulfate	OW-3S	3/24/94	564	500
Sulfate	OW-3S	10/5/93	564	500
Antimony	DB-02	9/30/96	0.007	0.006
Antimony	SB-01	9/30/96	0.007	0.006
Antimony	SB-05	9/30/96	0.007	0.006
Antimony	DB-03	9/30/96	0.008	0.006
Antimony	SB-01	1/7/97	0.008	0.006
Antimony	SB-04	9/30/96	0.008	0.006
Antimony	SB-02	1/7/97	0.009	0.006
Antimony	DB-01	2/14/97	0.013	0.006
Arsenic	BW-01	1/9/96	0.054	0.05
Arsenic	DB-04	9/30/96	0.055	0.05
Arsenic	OW-1S	10/5/93	0.063	0.05
Arsenic	OW-1S	10/5/93	0.063	0.05
Arsenic	OW-1S	3/23/94	0.086	0.05
Arsenic	OW-1S	3/23/94	0.086	0.05
Arsenic	PR-70	4/27/93	0.097	0.05
Arsenic	SMB-20	8/15/97	0.099	0.05
Arsenic	GA-A	1/11/96	0.235	0.05
Cadmium	PL-80	4/16/93	0.326	0.005
Copper	PL-80	4/16/93	73.4	1.3
Total Dissolved Solids	OW-3S	3/31/93	1380	1000
Total Dissolved Solids	OW-3S	1/11/96	1390	1000
Total Dissolved Solids	OW-3S	1/11/97	1390	1000
Total Dissolved Solids	OW-3S	9/13/94	1500	1000
Total Dissolved Solids	OW-3S	3/24/94	1550	1000
Total Dissolved Solids	OW-3S	10/5/93	1640	1000
Iron	SB-07	9/30/96	0.73	0.6
Iron	SB-02	1/7/97	1.49	0.6
Iron	DB-04	9/30/96	2.65	0.6
Iron	PL-80	4/16/93	159	0.6
Lead	OW-1S	3/31/93	0.062	0.015
Manganese	BW-01	6/18/96	0.11	0.1
Manganese	SB-06	1/7/97	0.116	0.1
Manganese	BW-01	1/9/96	0.168	0.1
Manganese	SB-07	9/30/96	0.172	0.1
Manganese	OW-3S	3/31/93	0.177	0.1

(Continued on next page)

Parameter	Well	Date	Result	MCL/SMCL
Manganese	SB-02	1/7/97	0.226	0.1
Manganese	SMB-22	4/7/97	0.268	0.1
Manganese	GA-C	1/10/96	0.424	0.1
Manganese	PL-80	4/16/93	1.14	0.1
Manganese	SMA-16	4/7/97	1.26	0.1
Manganese	GA-A	1/11/96	2.32	0.1
Mercury	DB-02	1/7/97	0.0052	0.002
Thallium	SB-01	9/30/96	0.003	0.002
Zinc	PL-80	4/16/93	35.1	5

observed in all the monitoring wells adjacent to the Highway Infiltration Site except for IM-1, a relatively deep monitoring well located upgradient and west of the infiltration area. The changes are most clearly manifested by an increase of TDS above background levels, followed by a gradual decline back toward the starting concentrations (Figure 4.4.10). The increased TDS levels were due to increases in calcium, chloride, potassium, magnesium, sodium, and sulfate.

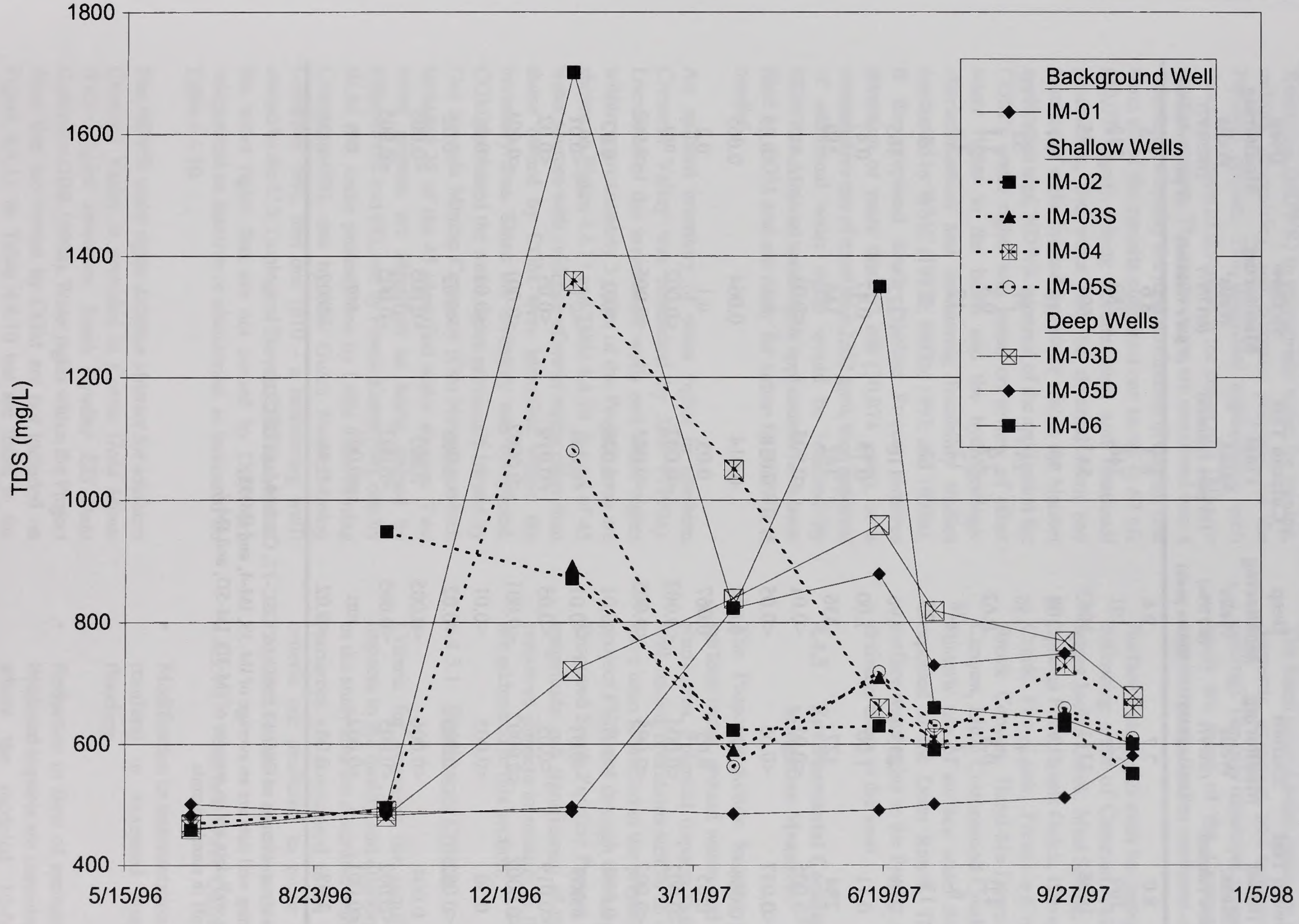
Increased solute levels appeared in the shallow monitoring wells IM-3S, IM-4, and IM-5S (90 to 145 feet deep) in January 1997, approximately five months after initiation of infiltration. These solute levels generally declined over the subsequent three months, approaching background levels in April 1997. Peak solute concentrations for the deeper monitoring wells IM-3D, IM-5D, and IM-6 (146 to 238 feet deep) occurred in June 1997, after which decreases in solute concentrations are observed.

Transitory changes in water quality have also been observed in monitoring wells adjacent to the Filippini Infiltration Site. These changes are most clearly manifested by a transitory increase in TDS above background levels in the June 17, 1997, sampling event, approximately six months after the initiation of infiltration at the site. The Filippini Infiltration Site has not been in operation as long as the Highway Infiltration Site; hence, most of the data from the Filippini monitoring wells indicate a peak in TDS concentrations beginning with the September or October 1997 samples.

Column leaching tests were conducted by Geomega (1998a) to evaluate the nature of the solute mobilization in the existing infiltration areas based upon core samples from the Frome Infiltration Site. Since the depositional processes and the source area for alluvial material at the proposed Frome Infiltration Site are generally similar to those at the other infiltration sites, the results obtained from column testing are expected to be representative of conditions at the other sites. The column test indicates that TDS and sulfate were the best indicators of solute leaching. The indicators required between 13 pore volumes and 102 pore volumes to return to influent levels. Table 4.4.9 presents the average column-test effluent compared to water quality observed in shallow and deep monitoring wells at the Highway Infiltration Site.

The analyte concentrations in Table 4.4.9 show that the initial sample from the column test are generally in good agreement with the water quality measurements obtained from the shallow monitoring wells at the Highway Infiltration Site in the first quarter of 1997. Both the column tests and the monitoring wells demonstrated TDS, alkalinity, calcium, chloride, sodium, and sulfate concentrations that were initially greater than the influent or background ground water concentrations. The concentrations measured in the column tests after passage of 13 pore volumes resembles the concentrations observed in the monitoring wells measured at the Highway Infiltration Site in the third quarter of 1997 for shallow wells and the fourth quarter of 1997 for the deep wells, after the equivalent passage of approximately nine pore volumes of infiltration water.

The results of background ground water quality characterization, infiltration monitoring, and column tests, demonstrate that infiltration of dewatering water results in a transitory increase in solute concentrations in infiltrating water. Column-test data in conjunction with the monitoring well data indicate that water quality tends to return to near ambient background conditions after passage of approximately 13 pore volumes of infiltration water.



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Observed TDS Concentrations in Monitoring Wells Adjacent to Highway Infiltration Site

Figure 4.4.10

SOUTH PIPELINE PROJECT EIS

Table 4.4.9: Comparison between Column Test and Highway Infiltration Site Water Quality

	Column Test Initial Meas.[1] (1 pore volume)	Shallow Monitoring Wells[2] (1/6/97) (solute peak)	Deep Monitoring Wells[3] (6/17/96) (solute peak)	Column Test Final Meas.[1] (13 pore volumes)	Shallow Monitoring Wells[2] (6/17/97) (9 pore volumes)	Deep Monitoring Wells[3] (12/30/97) (9 pore volumes)
pH	8.0	7.7	9.6	8.3	8.6	8.5
Alkalinity	309	225	191	246	280	212
TDS	1008	1111	1063	543	697	675
Calcium	52	113	108	50	15	34
Chloride	35	143	156	24	57	52
Fluoride	4.0	0.8	0.62	2.9	0.8	1.1
Potassium	6	7	28	12	17	12
Magnesium	13	27	23	17	2	5
Sodium	214	255	196	110	222	165
Nitrate	0.11	1.00	1.00	0.15	0.47	0.47
Sulfate	284	427	336	142	145	210
Silver	<0.005	<0.01	<0.01	<0.005	<0.01	nm
Aluminum	<0.037	<0.05	<0.05	0.038	0.1	<0.05
Arsenic	0.008	0.021	0.004	0.014	0.064	0.065
Barium	0.05	0.05	0.067	0.05	0.1	0.2
Beryllium	<0.002	<0.004	<0.002	<0.002	<0.002	nm
Cadmium	<0.002	<0.005	<0.005	<0.002	<0.005	<0.002
Chromium	0.009	<0.01	<0.01	<0.008	0.02	0.02
Copper	0.005	<0.01	<0.01	<0.004	<0.01	<0.01
Iron	<0.019	<0.05	<0.05	<0.019	<0.05	<0.02
Mercury	<0.0002	<0.0002	<0.001	<0.0002	<0.001	<0.001
Manganese	0.30	<0.005	<0.01	0.13	<0.01	<0.01
Lead	<0.002	<0.005	<0.02	<0.002	<0.02	<0.02
Antimony	0.004	<0.006	<0.005	0.003	<0.005	<0.005
Selenium	<0.002	<0.005	<0.005	<0.002	<0.005	<0.005
Thallium	<0.001	<0.002	nm	<0.001	nm	nm
Zinc	3.98	0.03	<0.02	0.48	<0.02	<0.02

1 Column test data are an average of GSC-15, GSC-16, GSC-17, GSC-19, and GSC-20.
2 Shallow monitoring well data are an average of IM-3S, IM-4, and IM-5S.
3 Deep monitoring well data are an average of IM-3D, IM-5D, and IM-6
Units are mg/L; pH in standard units

4.4.2.2.5 Water Rights

Numerous individual water rights applications were filed by CGM with the Nevada Division of Water Resources (NDWR) to appropriate water for mining, milling, dewatering, and domestic purposes for the Pipeline project. The individual applications each describe a point of diversion at the center of a 160-acre quarter section. The applications are combined into a "blanket," whereby the total continuous diversion rate from all of the permits combined can be up to 67 cfs (30,074 gpm). Using accumulation and rotational procedures, the water may be diverted from any number of wells located anywhere within the blanket application area. NDWR approval of the application for CGM's water rights was based on review of other water rights in the basin and the hydrogeologic characterization and dewatering feasibility studies conducted by WMC (1992a; 1992b; 1993; and 1995a). If the proposed South Pipeline Project requires diversion of more than 67 cfs (30,074 gpm), or a consumptive use of more than 2362 gpm, then approval of additional water rights would be required by NDWR. Additional water rights applications have been filed by CGM and are ready for action by NDWR if needed.

An updated inventory of water rights in southern Crescent Valley was conducted by JBR (1998a). Locations of the inventoried wells and water rights within approximately 5 miles of the Project Area are shown on Figure 4.4.11 and Table 4.4.10. A total of 45 water sources with evidence of water rights other than those owned by CGM were identified within the inventory area. Since the inventory was completed, CGM purchased the water rights previously owned by Oro Nevada Mining Company (Oro Nevada), which included 38 of the 45 identified water sources. Two water sources are identified as being owned by Filippini (#2 and #3), one by Fannie Komp (#4), one by BLM (#1; under protest), one by Little Gem Mining Company (#8), one by Mill Gulch Placer Mining Company (#9), and one (#10 - a monitoring well) owned by the U.S. Geological Survey (USGS). Most of the water rights that are not owned by CGM are categorized as inactive or abandoned, as indicated on Table 4.4.10.

The NDWR water rights database abstract for southern Crescent Valley is provided in *Cortez Gold Mines Water Rights Inventory, South Pipeline EIS Data Collection* (JBR 1998a). Water rights within the Project Area that are owned by CGM are not included on Figure 4.4.11 or Table 4.4.10 but are listed in the abstract. There may also be additional points of water use or claims of vested water rights for which the Nevada State Engineer has not conducted adjudication proceedings and, therefore, do not appear in the public record.

The listed ground water rights are designated for stock, domestic, irrigation, and industrial uses (mining and milling). The only municipal ground water rights in the basin are those of the Crescent Valley township, approximately 9 miles northeast of the Project Area.

Surface water rights exist for springs and streams in the following areas of Crescent Valley (NDWR 1997): upper Indian Creek, Mud Spring, Corral Canyon, Hot Springs Point, Scotts Gulch, Dewey Dann Creek, Duff Creek, Fire Creek, Frenchie Creek, Mule Canyon, Brock Canyon, Hand-Me-Down Creek, Four Mile Canyon, Little Cottonwood Creek, and Mill Canyon. Historic use of surface water from Indian Creek is reported at the Dean Ranch. There are no known surface water rights in the Project Area or the unnamed drainage basin to the west.

4.4.3 Environmental Consequences and Mitigation Measures

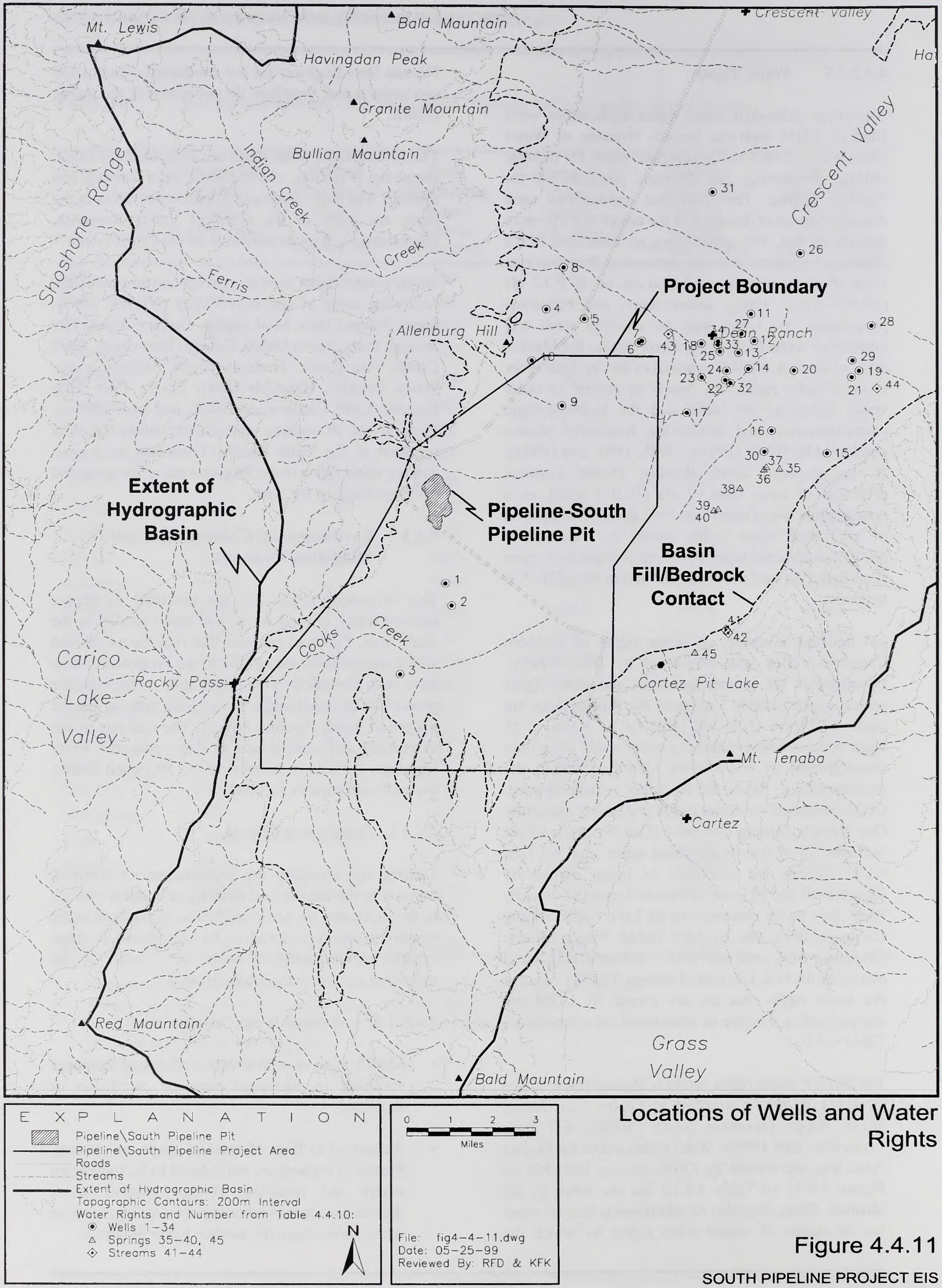
The Proposed Action has the potential to impact surface water, ground water, and water quality in the study area. Potential impacts that may be associated with mining operations similar to the Proposed Action have been identified in the preparation of the Pipeline project FEIS and through the scoping process for the Proposed South Pipeline Project. The analysis of the magnitude and significance of these potential water resources impacts in relation to the Proposed Action are addressed in this section.

4.4.3.1 Significance Criteria

Criteria for assessing the significance of potential impacts to the quality and quantity of water resources in the study area are described below. Impacts to water resources are considered to be significant if these criteria are predicted to occur as a result of the Proposed Action or the alternatives.

4.4.3.1.1 Surface Water Quantity

- Modification or sedimentation of natural drainages resulting in increased area or incidence of flooding.
- Reduction in flow of springs, seeps, or streams. Predicted impacts are considered to be significant where the modeled 10-foot ground water drawdown contour encompasses a spring, seep, or stream and where the surface water feature is



Locations of Wells and Water Rights

Figure 4.4.11

SOUTH PIPELINE PROJECT EIS

Table 4.4.10: Wells and Water Rights within 5 Miles of the Project Area

Map No.	Owner of Record	Town-ship	Range	Sect	1/4 of 1/4	Source	Abstract No.[1]	Use[2]	Data Reference[3]
1	BLM Windmill	27	47	08	NW of SW	Well	A-44757	Stk*	a,b,c
2	Filippini	27	47	17	NE of NW	Well	C-2773	Stk*	a,b,c
3	Filippini Windmill	27	47	19	SW of SW	Well		Stk	b,c
4	CGM[4]	28	47	10	SW of NW	Well	C-6656	MM	a,b,c
5	CGM[5]	28	47	11	NW of SW	Well	A-58398	Stk*	a,c
6	CGM[5]	28	47	13	NW of NE	Well	C-5458	Irr*	a,c
7	CGM[5]	28	47	13	NW of NE	Well		Dom	c
8	Little Gem	28	47	03	SW of NE	Well	C-4845	MM*	a,c
9	Mill Gulch Placer	28	47	22	NW of SE	Well	C-2599	MM*	a,b,c
10	USGS	28	47	16	SE of SE	Well		*	c
11	CGM[5]	28	48	09	NW of NW	Well	C-4066	Stk	a,c
12	CGM[5]	28	48	08	SE of SE	Well	C-4067	Stk	a,c
13	CGM[5]	28	48	17	SE of NE	Well	C-3997	Stk	a,c
14	CGM[5]	28	48	16	NW of SW	Well	C-3994	Stk	a,c
15	CGM[5]	28	48	27	NE of SE	Well	C-3995	Stk	a,c
16	CGM[5]	28	48	28	NW of NE	Well	C-3996	Stk	a,c
17	CGM[5]	28	48	19	NW of SE	Well	C-3998	Stk	a,c
18	CGM[5]	28	48	18	NE of NW	Well	A-63170	Stk	a,b,c
19	CGM[5]	28	48	14	NW of SE	Well	C-4271	Irr*	a,c
20	CGM[5]	28	48	15	NW of SW	Well	C-5044	Stk	a,c
21	CGM[5]	28	48	14	NE of SW	Well	C-5046	Stk	a,c
22	CGM[5]	28	48	17	SE of SW	Well	A-62977	Irr	a,c
23	CGM[5]	28	48	18	NE of SE	Well	A-62978	Irr	a,c
24	CGM[5]	28	48	17	SE of SW	Well	A-63168	Irr	a,c

(Continued on next page)

Map No.	Owner of Record	Town-ship	Range	Sect	1/4 of 1/4	Source	Abstract No.[1]	Use[2]	Data Reference[3]
25	CGM[5]	28	48	17	SE of NW	Well	A-63169	Irr	a,c
26	CGM[5]	29	48	34	SW of SW	Well	C-4309	Stk	a,c
27	CGM[5]	28	48	08	SE of SE	Well	A-63828	Stk	a,c
28	CGM[5]	28	48	11	NE of SE	Well	A-63830	Stk	a,c
29	CGM[5]	28	48	14	SW of NE	Well	A-63831	Stk	a,c
30	CGM[5]	28	48	28	SE of NW	Well	A-63832	Stk	a,c
31	CGM[5]	29	48		Lot 1230	Well	C-3773	Stk*	a,c
32	CGM[5]	28	48	17	SW of SE	Well	A-63829	Stk	a,c
33	CGM[5]	28	48	33	NW of NW	Well		Dom	c
34	CGM[5]	28	48	08	SW of SE	Well		Dom	c
35	CGM[5]	28	48	28	SW of SE	Spring	V-09010	Stk	a,c
36	CGM[5]	28	48	28	SE of SW	Spring	V-09008	Stk	a,c
37	CGM[5]	28	48	28	SE of SW	Spring	V-09009	Stk	a,c
38	CGM[5]	28	48	32	SE of NE	Spring	V-09007	Stk	a,c
39	CGM[5]	28	48	32	SE of SW	Spring	V-09005	Stk	a,c
40	CGM[5]	28	48	32	SW of SW	Spring	V-09006	Stk	a,c
41	CGM[5]	27	48	17	NW of SE	Stream	C-5646	Irr	a,c
42	CGM[5]	27	48	17	NW of SE	Stream	C-5647	Irr	a,c
43	CGM[5]	27	48	07	SW of SW	Stream		Irr	c
44	CGM[5]	28	48	13	SW of SW	Stream		Irr	c
45	CGM[5]	27	48	19	SE of NE	Spring	C-3999	Stk	a,c

[1] A = Application; C = Certificate; V = Vested
[2] Stk: Stock; Dom: Domestic; Irr: Irrigation; MM: Mining and Milling; * : Inactive or abandoned
[3] a: NDWR 1998; b: BLM 1996; c: JBR 1998a
[4] Previously owned by Komp
[5] Previously owned by Oro Nevada Mining

hydraulically connected to the aquifer affected by drawdown.

- Diversion and/or consumptive use of ground water that adversely affects other water rights holders. This criterion includes flows to springs, seeps, or streams where existing beneficial water uses are affected.

4.4.3.1.2 Ground Water Quantity

- Lowering of the water table that results in impacts to other ground water users. The threshold for identifying significant impacts to wells is the modeled 10-foot drawdown contour. Therefore, for the purposes of this study, significant impacts are indicated where the 10-foot contour encompasses an existing well with an active water right and the well is hydraulically connected to the aquifer affected by drawdown.

- A long-term consumptive use of water resources that does not provide water for a beneficial use.

4.4.3.1.3 Surface Water Quality

- Release of mining-related contaminants such as cyanide, or metals such as arsenic and lead, into drainages by spills or flooding that results in soil/sediment contamination in excess of NDEP guidance levels (10 times any applicable maximum contaminant level (MCL) as measured in a meteoric water mobility test (MWMP), or release of fuels and lubricants into drainages resulting in soil contamination exceeding the NDEP guidance level (100 mg/kg of total petroleum hydrocarbons (TPH)).

- A discharge or change in water quality that results in an exceedance of the applicable NDEP standards (Table 4.4.11) for municipal or domestic supplies, aquatic life, irrigation, livestock, or other applicable standards to protect existing or potential beneficial uses in perennial streams, springs, seeps, and the post-mining pit lake.

4.4.3.1.4 Ground Water Quality

- Degradation of natural ground water quality by chemicals such that concentrations exceed NDEP MCLs for drinking water, or render water unsuitable for other existing or potential beneficial uses. For ground water that does not meet MCLs for baseline conditions, degradation will be considered significant where a change in water quality would render the water unsuitable for an existing or potential beneficial use. This criterion is based on NAC 445A.424.

- Diversion and/or consumptive use of surface water that adversely affects other water rights holders.

- Degradation of natural soil chemistry by cyanide, trace metals, or other compounds such that concentrations exceed NDEP guidance levels. NDEP guidance levels for soils are based on results of meteoric water mobility testing that are ten times the drinking water standard for each compound. This guidance is designed to protect ground water from contamination by leachate from overlying soils.

4.4.3.2 Assessment Methodology

The ground water flow model, MODFLOW (McDonald and Harbaugh 1988) has been utilized to quantify the project's hydrologic effects on water table drawdown, pit inflow and refilling, and the water balance of Crescent Valley. A more refined ground water flow model than that used for the Pipeline FEIS was developed to provide greater detail in the pit area and to enhance coupling of the ground water flow model with the pit water quality modeling. Modeling of the No Action Alternative represents the mining activities included in the Pipeline project, although the model results differ from those presented in the Pipeline FEIS (BLM 1996a) because of the different model approaches used, the model refinements are due to calibration with actual dewatering pumping rates and observed drawdowns, and because some aspects (e.g. assumed pumping rates and duration of dewatering) of the Pipeline Plan of Operations have been changed. The new model was calibrated to two years of actual pumping, infiltration, and drawdown data, and was subjected to extensive verification and sensitivity analyses. Model packages that were used in conjunction with MODFLOW include the Interbed-Storage Package (Leake and Prudic 1988) to evaluate subsidence effects of dewatering, and the recently available LAK2 package (Council 1997) to evaluate filling of the pit lake after mining. Details of the model including methods, hydraulic boundaries, model layers, grid layout, calibration, sensitivity analysis, and results are presented in Geomega (1998a).

Hydrochemical modeling was performed to predict post-closure pit lake water quality. Details of the modeling are presented in Geomega (1998c). The pit lake water quality is derived from several different sources of water as well as chemical processes that act on the solution, as shown on Figure 4.4.12. The modeling utilized data from field experiments and

Table 4.4.11: Standards for Toxic Materials Applicable to Designated Waters

Chemical	Municipal/ Domestic (μg/l)	Aquatic Life (μg/l)	Irrigation (μg/l)	Watering Livestock (μg/l)
Antimony	146[a]	-	-	-
Arsenic	50[b]	-	100[c]	200[d]
Arsenic(III)	-	-	-	-
1-hour average	-	342[a,g]	-	-
96-hour average	-	180[a,g]	-	-
Barium	2,000[b]	-	-	-
Beryllium	0[a]	-	100[c]	-
hardness≤75mg/l	-	-	-	-
hardness≥=75mg/l	-	-	-	-
Boron	-	-	750[a]	5,000[d]
Cadmium	5[b]	-	10[d]	50[d]
1-hour average	-	0.85 exp {1.128In(H)-3.828}[a,g]	-	-
96-hour average	-	0.85 exp {0.7852In(h)-3.490}[a,g]	-	-
Chromium(total)	100[b]	-	100[d]	1,000[d]
Chromium(VI)	-	-	-	-
1-hour average	-	15[a,g]	-	-
96-hour average	-	10[a,g]	-	-
Chromium(III)	-	-	-	-
1-hour average	-	0.85 exp {0.8190In(H)+3.688}[a,g]	-	-
96-hour average	-	0.85 exp {0.8190In(H)+1.561}[a,g]	-	-
Copper	-	-	200[d]	500[d]
1-hour average	-	0.85 exp{0.9422In(H)-1.464}[a,g]	-	-
96-hour average	-	0.85 exp {0.8545In(H)-1.465}[a,g]	-	-
1-hour average	-	22[a]	-	-
Cyanide	200[a]	-	-	-
96-hour average	-	5.2[a]	-	-
Fluoride	-	-	1,000[d]	2,000[d]
Iron	-	1,000[a]	5,000[d]	-
Lead	50[a,b]	-	5,000[d]	100[d]
1-hour average	-	0.50 exp {1.273In(H)-1.460}[a,g]	-	-
96-hour average	-	0.25 exp {1.273In(H)-4.705}[a,g]	-	-
Manganese	-	-	200[d]	-
Mercury	2[b]	-	-	10[d]
1-hour average	-	2.0[a,g]	-	-
96-hour average	-	0.012[a]	-	-

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Chemical	Municipal/ Domestic (μg/l)	Aquatic Life (μg/l)	Irrigation (μg/l)	Watering Livestock (μg/l)
Molybdenum	-	19[e]	-	-
Nickel	13.4[a]	-	200[d]	-
1-hour average	-	0.85 exp {0.8460In(H)+3.3612}[a,g]	-	-
96-hour average	-	0.85 exp {0.8460In(H)+1.1645}[a,g]	-	-
Selenium	50[b]	-	20[d]	50[d]
1-hour average	-	20[a]	-	-
96-hour average	-	5.0[a]	-	-
Silver	-	0.85 exp {1.72In(H)-6.52}[a,g]	-	-
Sulfide				
Undissociated hydrogen sulfide	-	2[a]	-	-
Thallium	13[a]	-	-	-
Zinc	-	-	2,000[d]	25,000[d]
1-hour average	-	0.85 exp {0.8473In(H)+0.8604}[a,g]	-	-
96-hour average	-	0.85 exp {0.8473In(H)+0.7614}[a,g]	-	-
Acrolein	320[a]	-	-	-
Aldrin	0[a]	3[a]	-	-
Chlordane	0[a]	2.4[a]	-	-
24-hour average	-	0.0043[a]	-	-
2,4-D	100[a,b]	-	-	-
DDT&metabolites	0[a]	1.1[a]	-	-
24-hour average	-	0.0010[a]	-	-
Demeton	-	0.1[a]	-	-
Dieldrin	0[a]	2.5[a]	-	-
24-hour average	-	0.0019[a]	-	-
Endosulfan	75[a]	0.22[a]	-	-
24-hour average	-	0.056[a]	-	-
Endrin	0.2[b]	0.18[a]	-	-
24-hour average	-	0.0023[a]	-	-
Guthion	-	0.01[a]	-	-
Heptachlor	-	0.52[a]	-	-
24-hour average	-	0.0038[a]	-	-
Lindane	4[b]	2.0[a]	-	-
24-hour average	-	0.080[a]	-	-
Malathion	-	0.1[a]	-	-
Methoxychlor	100[a,b]	0.03[a]	-	-
Mirex	0[a]	0.001[a]	-	-
Parathion	-	-	-	-
1-hour average	-	0.065[a]	-	-
96-hour average	-	0.013[a]	-	-
Silvex (2.4.5-TP)	10[a,b]	-	-	-

(Continued on next page)

Chemical	Municipal/ Domestic (μg/l)	Aquatic Life (μg/l)	Irrigation (μg/l)	Watering Livestock (μg/l)
Toxaphene	5[b]	-	-	-
1-hour average	-	0.73[a]	-	-
96-hour average	-	0.0002[a]	-	-
Benzene	5[b]	-	-	-
Monochlorobenzene	488[a]	-	-	-
m-dichlorobenzene	400[a]	-	-	-
o-dichlorobenzene	400[a]	-	-	-
p-dichlorobenzene	75[b]	-	-	-
Ethylbenzene	1,400[a]	-	-	-
Nitrobenzene	19,800[a]	-	-	-
1.2 dichloroethane	5[b]	-	-	-
1.1.1-trichloroethane (TCA)	200[b]	-	-	-
Bis (2-chloroisopropyl) ether	34.7[a]	-	-	-
Chloroethylene (vinylchloride)	2[b]	-	-	-
1.1-dichloroethylene	7[b]	-	-	-
Trichloroethylene (TCE)	5[b]	-	-	-
Hexachlorocyclopentadiene	206[a]	-	-	-
Isophorone	5,200[a]	-	-	-
Trihalomethanes (total)[f]	100[b]	-	-	-
Tetrachloromethane (carbontetrachloride)	5[b]	-	-	-
Phenol	3,500[a]	-	-	-
2,4-dichlorophenol	3,090[a]	-	-	-
Pentachlorophenol	1,010[a]	-	-	-
1-hour average	-	exp {1.005(pH)-4.830}[a]	-	-
96-hour average	-	exp {1.005(pH)-5.290}[a]	-	-
Dinitrophenols	70[a]	-	-	-
4,6-dinitro-2-methylphenol	13.4[a]	-	-	-
Dibutylphthalate	34,000[a]	-	-	-
Diethylphthalate	350,000[a]	-	-	-
Dimethylphthalate	313,000[a]	-	-	-
Di-2-ethylhexylphthalate	15,000[a]	-	-	-
Polychlorinatedbiphenyls (PCBs)	0[a]	-	-	-
24-hour average	-	0.014[a]	-	-
Fluoranthene (polynucleararomatichydrocarbon)	42[a]	-	-	-
Dichloropropenes	87[a]	-	-	-
Toluene	14,300[a]	-	-	-

1 Single concentration limits and 24-hour average concentration limits must not be exceeded. One-hour average and 96-hour average concentration limits may be exceeded only once every 3 years. See reference a.

2 Hardness (H) is expressed as mg/l $CaCO_3$.

[3] If a criterion is less than the detection limit of a method that is acceptable to the division, laboratory results which show that the substance was not detected will be deemed to show compliance with the standard unless other information indicates that the substance may be present.

[4] If a standard does not exist for each designated beneficial use, a person who plans to discharge waste must demonstrate that no adverse effect will occur to a designated beneficial use. If the discharge of a substance will lower the quality of the water, a person who plans to discharge waste must meet the requirements of NRS 445A.565.

[5] The standards for metals are expressed as total recoverable, unless otherwise noted.

[a] U.S. Environmental Protection Agency, Pub. No. EPA 440/5-86-001, Quality Criteria for Water (Gold Book) (1986).

[b] Federal Maximum Contaminant Level (MCL), 40 C.F.R. §§ 141.11, 141.12, 141.61 and 141.62 (1992).

[c] U.S. Environmental Protection Agency, Pub. No. EPA 440/9-76-023, Quality Criteria for Water (Red Book) (1976).

[d] National Academy of Sciences, Water Quality Criteria (Blue Book) (1972).

[e] California State Water Resources Control Board, Regulation of Agricultural Drainage to the San Joaquin River: Appendix D, Water Quality Criteria (March 1988 revision).

[f] The criteria for trihalomethanes (total) is the sum of the concentrations of bromodichloromethane, dibromochloromethane, tribromomethane (bromoform) and trichloromethane (chloroform). See reference b.

[g] This standard applies to the dissolved fraction. (Added to NAC by Environmental Comm'n, eff. 9-13-85; A 9-25-90; 7-5-94; A 11-29-95)

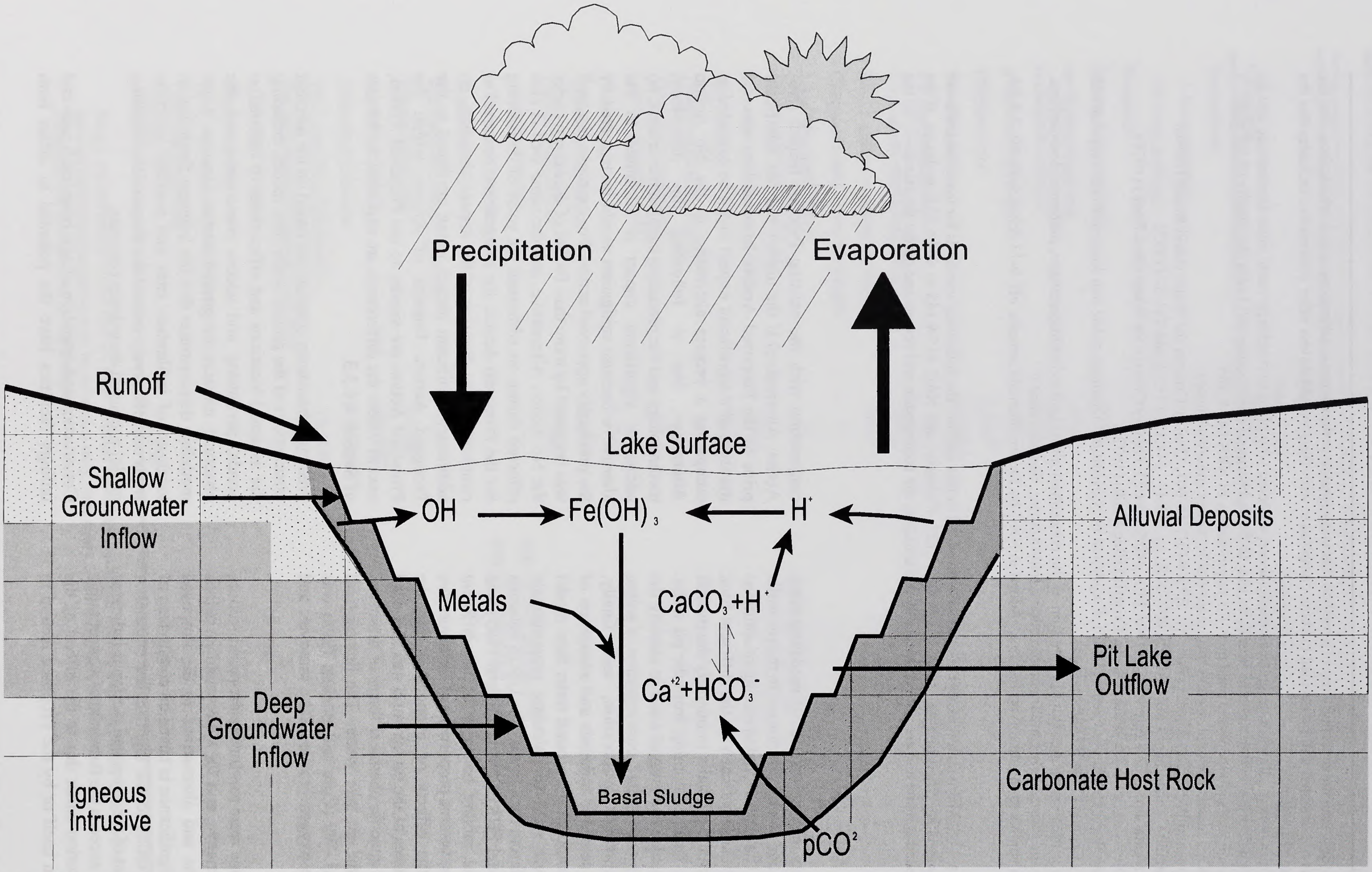
Source: NAC 445A.144, which states, except as otherwise provided in this section, the following standards for toxic materials are applicable to the waters specified in NAC 445A.123 to 445A.127, inclusive, and NAC 445A.145 to 445A.225, inclusive. If the standards are exceeded at a site and are not economically controllable, the commission will review and adjust the standards for the site.

laboratory tests as input to a series of modeling steps designed to simulate natural conditions in the pit walls and the pit lake. The steps included mixing of solutions derived from oxidation of each of the different rock types occurring in the pit walls to quantify the overall chemistry of the leachate coming from the pit walls, mixing of the leachate and ground water to identify the chemistry of the pit lake water, concentration of solute chemistry to simulate evaporation, and, finally, precipitation of saturated minerals and adsorption of metal cations. Results of the ground water flow model MODFLOW were used to calculate proportionate inflows from different rock types. The USGS aqueous geochemical model PHREEQC (Parkhurst 1995) was used to calculate mixing behavior of the different waters based upon volume proportions of the respective solutions and the effects of evaporation for the different filling times of the pit lake and was also used to determine the specific chemical forms of dissolved constituents in the pit lake water. The limnological model CE-QUAL-W2 (Cole and Buchak 1995) was used to evaluate oxygen profiles, lake turnover, and mixing.

Model simulations were run for the Proposed Action, No-Action Alternative, and for appropriate variations including options and alternatives to the Proposed Action. Impact significance is based on comparison of the simulation results to the significance criteria. A significant impact of the Proposed Action is indicated where an impact exceeds the threshold of a quantitative significance criterion either due to the effects of the Proposed Action itself or by the Proposed Action in conjunction with the existing Pipeline project (No-Action Alternative) if the impact was not significant prior to the Proposed Action. In some instances the duration of a significant impact might be extended in comparing a project alternative to the No Action Alternative, but in following this assessment methodology and the preceding significance criteria, no additional significant impact is attributed to the alternative because mitigation would be triggered by the previously approved action. For example, if a well was impacted by more than 10 feet of drawdown under the No Action Alternative, and the same well is also affected during an additional six years of dewatering for the Proposed Action, the mitigation is assumed to continue for the duration of the impact, therefore, an additional significant impact is not attributed to the Proposed Action. Impacts of options within the Proposed Action are similar to the Proposed Action, except where the differences are explained in the text of Section 4.4.3.3.

Predicted drawdown contours are based on the inherent assumptions of the ground water flow model, including the assumed locations and efficiencies of infiltration ponds, permitting and access constraints, and the observed impacts to ground water. Ground water modeling demonstrates that the inherent flexibility in locations of infiltration sites and possible injection wells can effectively control the shape of the resulting model-predicted drawdown contours.

Construction and operation of new heap leach pads and tailings facilities have the potential to affect both



Conceptual Model of Pit Lake Chemistry Evolution

E X P L A N A T I O N

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Reviewed By: RFD & KFK

Figure 4.4.12

SOUTH PIPELINE PROJECT EIS

ground water and surface water quality through drainage and/or seepage of process solutions. Impacts to water quality from these sources would be less than significant because the facilities are inherently designed as zero discharge facilities with stringent operational and post-closure monitoring programs, reclamation plans, and performance bonding. Similarly, there is potential for spills of fuels, chemical reagents, and hazardous materials to affect water quality. Potential impacts of spills and accidental releases would be rendered less than significant because of preventive and corrective measures that are included in the SPCC Plan described in Section 3.6.7.2.

4.4.3.3 Proposed Action

4.4.3.3.1 Environmental Consequences and Mitigation Measures

Surface Water Resources

Erosion, Sedimentation, and Flooding Within Rerouted Drainages

The Project would require the alteration or diversion of existing natural drainages and washes that contain surface flow during the infrequent periods of high rainfall and snowmelt from the Shoshone Range. The existing and expanded stormwater diversion structure is designed to divert flows of a 100-year, 24-hour storm event from the unnamed drainage west of the pit and mine facilities. The heap leach and tailings facilities are designed to contain a 100-year, 24-hour storm event in addition to normal process fluids. Surface disturbance generally causes increase in erosion, therefore, sediment from increased erosion may be transported to and accumulate in the local surface drainages. During mine operation, standard erosion prevention and maintenance procedures (see Section 3.9) would reduce impacts to less than significant levels.

Small drainages affected by roads and small facility structures would be returned to their natural condition during reclamation. Permanent drainage alterations around the pit, waste piles, and heap leach pads would consist of open channels and berms. Such features would be left in place and reclaimed using re-vegetation or rock lining for stability and elimination of long-term maintenance under post-closure conditions.

▣ **Impact 4.4.3.3.1-1:** Grading, earth moving, diversion of drainages, and placement of fill could accelerate erosion, sedimentation, and alter surface water flood runoff patterns during mining and post-closure.

Significance of the Impact: The impact is considered less than significant and no mitigation measures are required.

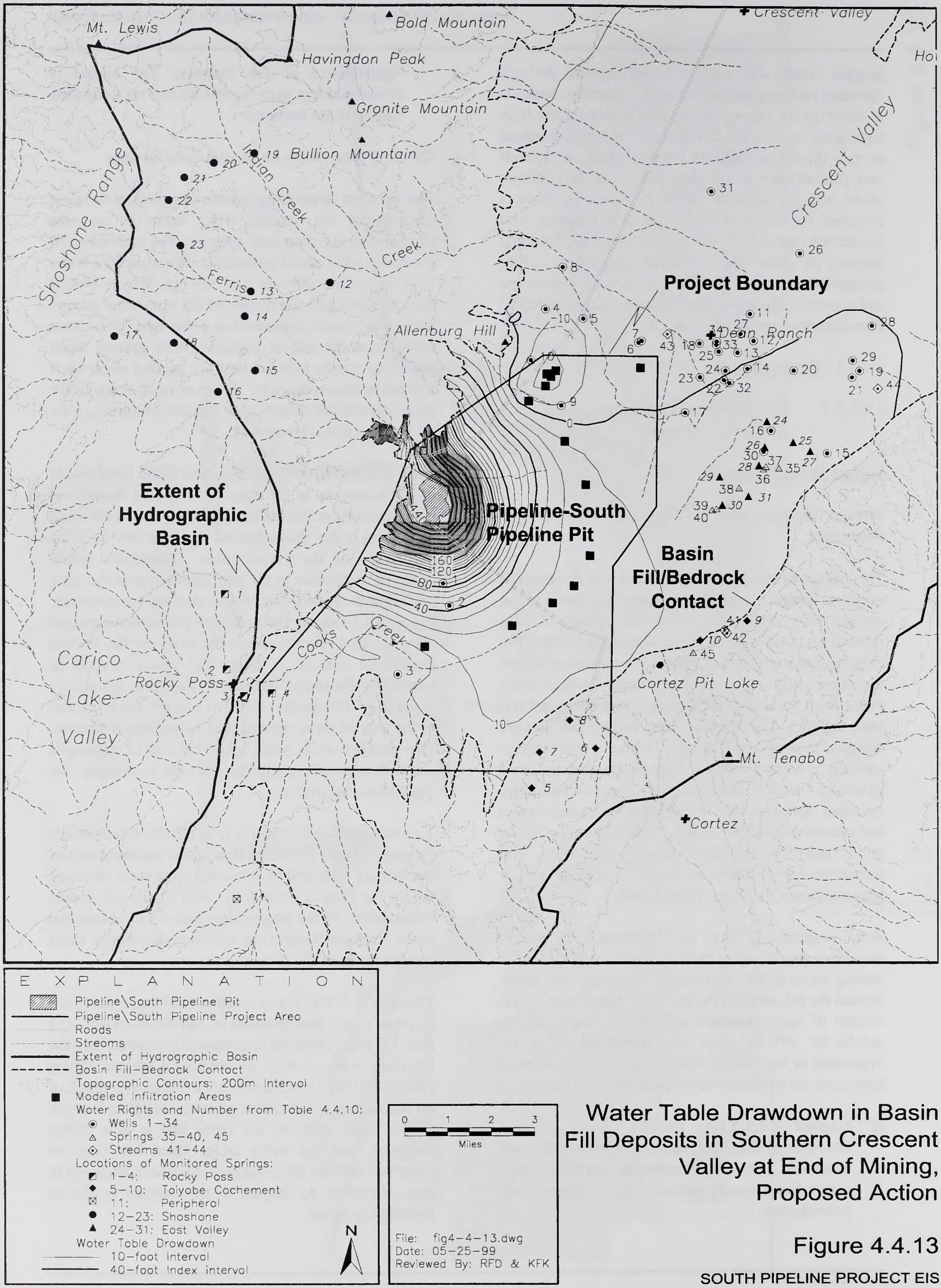
Effects of Drawdown on Streams and Springs

The open pit dewatering system is expected to lower (drawdown) the ground water table in an area surrounding the proposed open pit. The drawdown of the water table could potentially affect surface water flow in certain streams and springs. Figure 4.4.13 shows graphically the results of the numerical ground water flow model expressed as water table drawdown contours at the end of mining. These ground water modeling results indicate that the ground water level will not be drawn down by 10 feet or more at any of the perennial streams or springs at the end of mining, after 13 years of mine dewatering.

After dewatering ceases, the ground water level would begin to recover in the open pit area and the ground water mounds in the infiltration areas would dissipate as ground water flows toward the open pit from the perimeters of the project area. Drawdown would continue to increase in the perimeter areas as the open pit fills with ground water that is derived from storage. Figure 4.4.14 shows the predicted drawdown contours 20 years after mining, where the extent of the 10-foot drawdown contour is about 2-3 miles beyond its location at the end of mining. At this time, drawdown in the basin-fill aquifer of 10 feet or more would extend to the area of three springs, and no perennial streams. The drawdown 20 years after the end of mining is selected as the most appropriate time to compare the significance of impacts.

Two creeks enter the Project Area: Cooks Creek enters Crescent Valley at Rocky Pass at the southern end of the Project Area and an unnamed ephemeral drainage enters the Project Area from west of the pit. Indian Creek is one of the largest drainages in the basin and enters Crescent Valley from the Shoshone Range about 3 miles north of the Project Area.

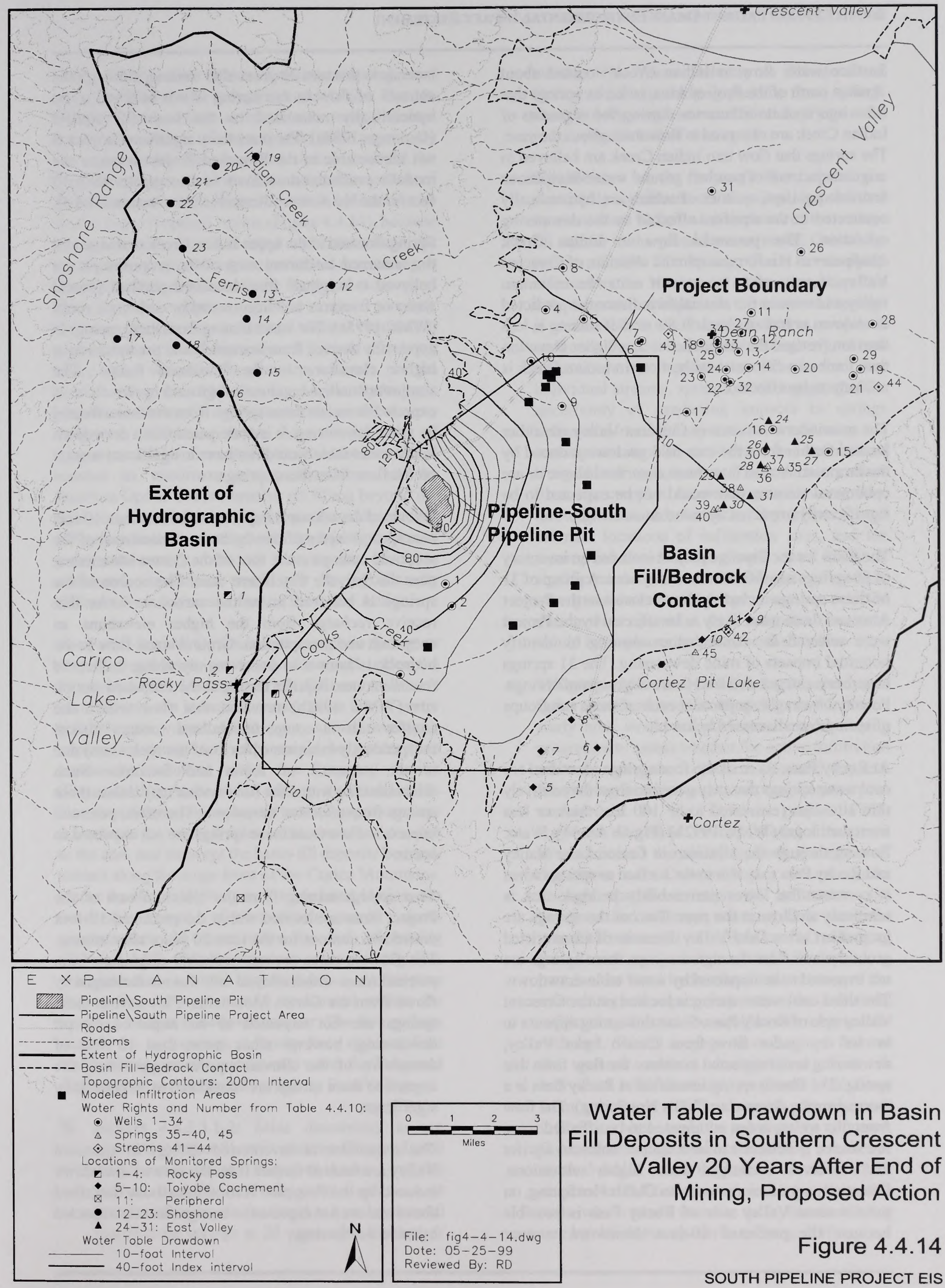
The flow in Cooks Creek is ephemeral and usually is a result of heavy precipitation or snowmelt runoff. The flow has been observed to completely infiltrate into the alluvium within a mile of entering Crescent Valley (WMC 1992b). Lowering the water table as a result of pit dewatering would not be expected to affect flows in Cooks Creek because the creek bed is at a higher elevation than the water table. There has been no observed flow in the unnamed ephemeral drainage to date, therefore no impact to this stream would be expected to occur.



Water Table Drawdown in Basin Fill Deposits in Southern Crescent Valley at End of Mining, Proposed Action

Figure 4.4.13

SOUTH PIPELINE PROJECT EIS



Water Table Drawdown in Basin Fill Deposits in Southern Crescent Valley 20 Years After End of Mining, Proposed Action

Figure 4.4.14

Surface water flow in Indian Creek, located about 3 miles north of the Project Area, is fed by springs that flow into it or its tributaries. Spring-fed segments of Indian Creek are observed to flow throughout the year. The springs that flow into Indian Creek are believed to originate in areas of perched ground water or siliceous bedrock aquifers, neither of which are hydraulically connected to the aquifers affected by the dewatering operation. The perennial flow in Indian Creek disappears as it infiltrates into the alluvium of Crescent Valley shortly after the stream exits the mountain valley and crosses the alluvial fans. Since the predicted drawdown at Indian Creek at the end of mining is less than ten feet and the stream bed is at a higher elevation than the basin-fill water table, flow in Indian Creek is unlikely to be affected.

The remainder of streams in Crescent Valley are either located farther from the area of drawdown induced by the Proposed Action than those described above or are ephemeral streams that would not be expected to be significantly impacted by mine dewatering.

The FEIS for the Pipeline project included an inventory of 68 springs identified in the study area. A group of 31 of these springs including those closest to the Project Area and those most likely to be affected by the Project were selected for continued monitoring to identify potential impacts of mine dewatering. The 31 springs have been categorized into four subgroups of springs. Potential hydraulic impacts at each of these subgroups of springs are discussed below.

At Rocky Pass, three of the four springs identified are cool water springs that may generate from the relatively thin alluvium (estimated to be 100 feet thick or less from well logs) (WMC 1992b) (Figure 4.4.11). Water flowing through the alluvium in Carico Lake Valley and Rocky Pass may rise to the surface as springs when it contacts the lower permeability bedrock that is relatively shallow at the pass. Two of the springs are located in Carico Lake Valley. Because of the restricted ground water flow through the pass, these springs are not expected to be impacted by water table drawdown. The third cool water spring is located on the Crescent Valley side of Rocky Pass. Since this spring appears to be fed by under flow from Carico Lake Valley, dewatering is not expected to reduce the flow from this spring. The fourth spring identified at Rocky Pass is a thermal spring (known as Chillis Hot Spring). The flow from this spring is not anticipated to be affected since the source is believed to be a deeper volcanic aquifer that receives recharge from higher elevations. Potentially significant impacts to Chillis Hot Spring, on the Crescent Valley side of Rocky Pass is possible because the predicted 10-foot drawdown contour extends to this area 20 years after mining, although the sources of flow to this spring is not believed to be hydraulically connected to the basin-fill aquifer (Geomega 1998a). The potentially significant impact is not attributable to the Proposed Project because the model's predicted drawdown is also greater than 10 feet for the No Action Alternative (see Section 4.4.3.5).

Springs located in the upper Indian Creek drainage and the unnamed catchment west of the proposed pit are believed to originate from localized perched ground water or fractures in siliceous and/or carbonate rocks (WMC 1995a). The water issuing from these springs is apparently derived from snowmelt and precipitation at higher elevations in the Shoshone Range. The compartmentalized nature of ground water flow is expected to isolate these springs from the area affected by mine dewatering. It is anticipated that a drawdown in the water table would not have a significant impact on the flow from these springs.

Estimated drawdown is expected to be less than 10 feet near springs issuing from the bedrock southeast of the proposed open pit at the foot of the Cortez Mountains, near the Toiyabe Catchment area. The source of the springs is believed to be the carbonate rocks that receive recharge from the higher elevations as snowmelt and precipitation. Ground water flow in the bedrock is known to occur mainly along faults and fracture zones. Aquifer testing at the Proposed Action site (WMC 1992b) revealed that flow within the aquifer unit is compartmentalized (occurs almost independently in separate blocks of the rock mass) due to the presence of faults and fractures. Such discontinuities within the flow system may isolate these springs from effects of drawdown. Therefore, potential impacts to flow from these springs are not expected to occur.

Two springs issuing from the alluvium east of the Project Area are located within the predicted 10-foot drawdown contour for the time 20 years after mining. The flow to these springs probably originates from perched zones within alluvial fans that are recharged by flows from the Cortez Mountains. Flows from these springs are not expected to be impacted by pit dewatering, however since more than 10 feet of drawdown of the alluvial aquifer is predicted, the impacts to these springs are considered to be potentially significant.

The remainder of inventoried springs in Crescent Valley are located farther from the area of drawdown induced by the Proposed Action than those described above and are not expected to be significantly impacted by mine dewatering.

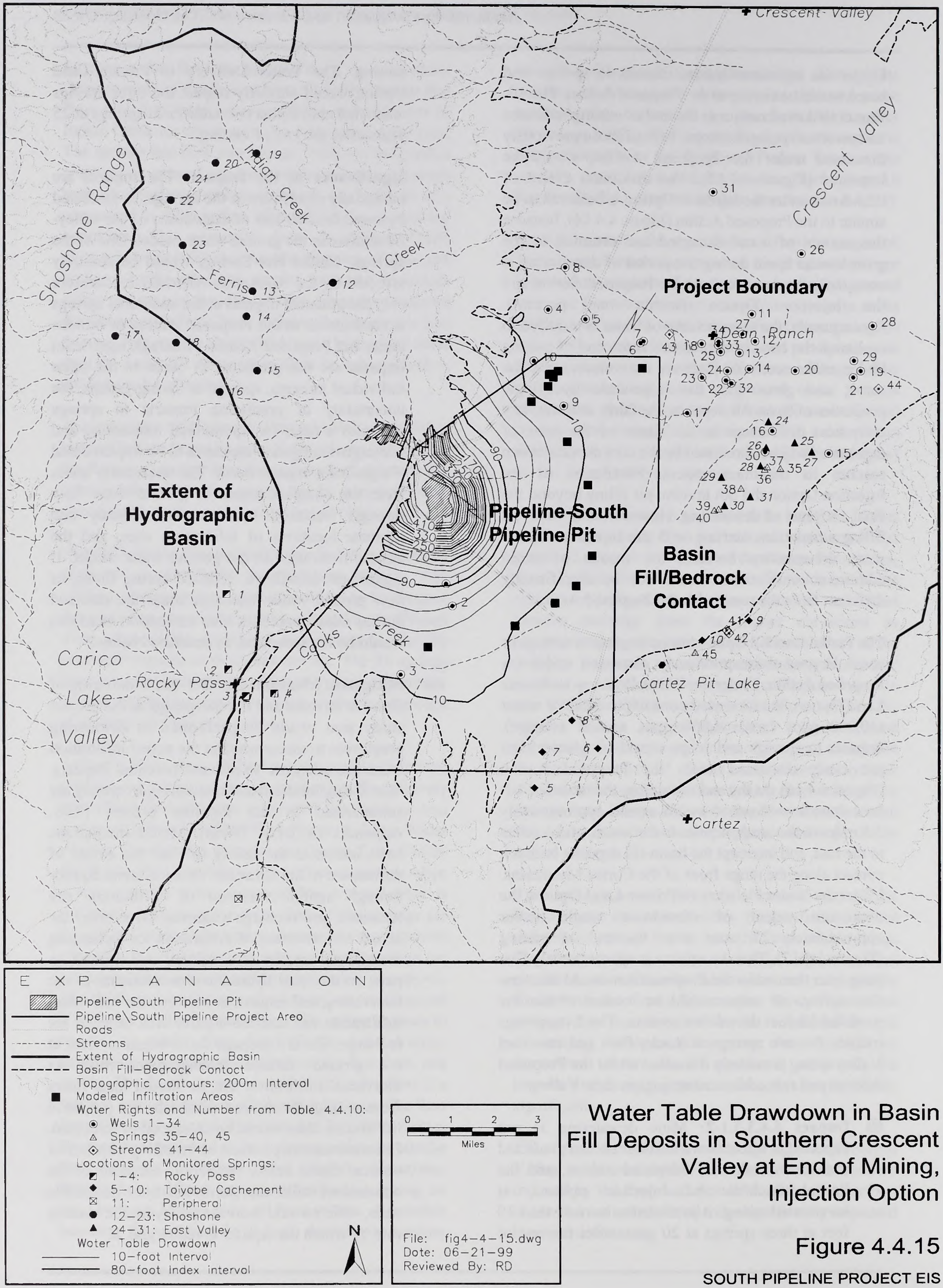
Under the Injection Option, impacts to springs and seeps would be similar to the Proposed Action. The 10-foot drawdown contour at the end of mining indicates that no other springs or seeps, beyond those previously discussed under the Proposed Action, would be impacted (Figure 4.4.15). The maximum extent of drawdown under the Injection Option is believed to be similar to the Proposed Action (Figure 4.4.14), because the amount of water extracted and returned to the groundwater basin during the period of dewatering is essentially the same for both the Proposed Action and the Injection Option (within one percent). Consequently, the same volume of water is required to replenish the cone of depression at the end of mining under either scenario. Because the volumes are the same, and given that the large-scale hydrologic properties of basin-fill deposits are fairly uniform, any early-time differences in the shape of the cone of depression will be eliminated by the time the drawdown reaches its maximum extent. Simulation of the Injection Option did not involve pit filling beyond the final six years of dewatering. However, additional pit filling simulations starting with the Injection Option were unnecessary because the results of those additional simulations would not be significantly different from the results for the Proposed Action.

The Partial Backfill Option has no impacts to springs or seeps beyond those previously discussed under the Proposed Action. Under the Water Delivery to Private Land Option, the increased consumptive use of water (10,000 gpm versus 4,000 gpm, annual average), impacts to springs and seeps would be greater than previously discussed under the Proposed Action (Figure 4.4.16). At the end of mining, the modeled 10-foot drawdown contour would extend approximately 3.5 miles to the north, 4 miles to the south, and 6 miles to the east, and intercept the basin-fill deposits bedrock contact along the range front of the Cortez Mountains. Under the Water Delivery to Private Land Option, the maximum extent of drawdown would occur approximately 25 years after the end of mining (Figure 4.4.17). This drawdown is approximately five years later than under the Proposed Action. At this time five springs or seeps would be located within the modeled 10-foot drawdown contour. The five springs include the two springs at Rocky Pass and one East Valley spring previously discussed under the Proposed Action, and two additional springs in East Valley.

▣ **Impact 4.4.3.3.1-2:** Mine dewatering is not expected to affect flows in streams. The predicted drawdown under the Proposed Action, and the Partial Backfill and Injection options, at inventoried springs is predicted to be more than 10 feet at three springs at 20 years after the end of mining. The Water Delivery to Private Land Option would similarly impact the three springs identified above plus two additional springs at 25 years after the end of mining.

Significance of the Impact: The impacts are potentially significant at the springs, as predicted by more than 10 feet of drawdown of the valley-fill aquifer in the ground water model. One of the springs, Chillis Hot Spring, would be similarly affected by the No-Action Alternative, therefore only the potential impacts at the additional springs is attributable to the Proposed Action or options under the Proposed Action. Although significant impacts are not predicted to occur in the other individual streams, springs or spring groups, the uncertainty of predicting impacts to springs indicates a need for operational monitoring and contingent mitigation measures to be implemented if significant impacts occur. The uncertainty arises from the complex nature of ground water flow through fractured bedrock, the efficacy and ultimate locations of infiltration sites, and the assumptions used in the ground water model. If significant drawdown, reduced spring flows, or new ground water discharge areas are detected during mine operation, then mitigation measures would be implemented, as described below.

- **Mitigation Measure 4.4.3.3.1-2a:** Monitoring of flows at streams and the 68 springs in the project study area would be performed as dewatering progresses to assess whether the active infiltration areas are adequate to prevent potential impacts. Monitoring locations and monitoring frequency are summarized in the Pipeline project FEIS, Appendix D (BLM 1996a). Model simulations have indicated the ability to limit the extent of drawdown in the Crescent Valley alluvial aquifer through spatial variation of infiltration site locations and recharge volumes. Over time, the actual effectiveness of infiltration for recharging the alluvial aquifer as simulated will depend, in part, on the local hydraulic characteristics of the intervening soil sequences between the individual infiltration site and the aquifer area targeted for recharge. Should seepage faces begin to form at the ground surface downgradient from an individual infiltration site, or should local flows from springs or streams diminish, the proposed infiltration sites would be enhanced or relocated. Enhancement may consist of installing trenches or vertical drains below the bottom elevation of the constructed infiltration ponds into more permeable soils, which would increase the hydraulic loading rate by which the aquifer is recharged. If



Water Table Drawdown in Basin Fill Deposits in Southern Crescent Valley at End of Mining, Injection Option

Figure 4.4.15

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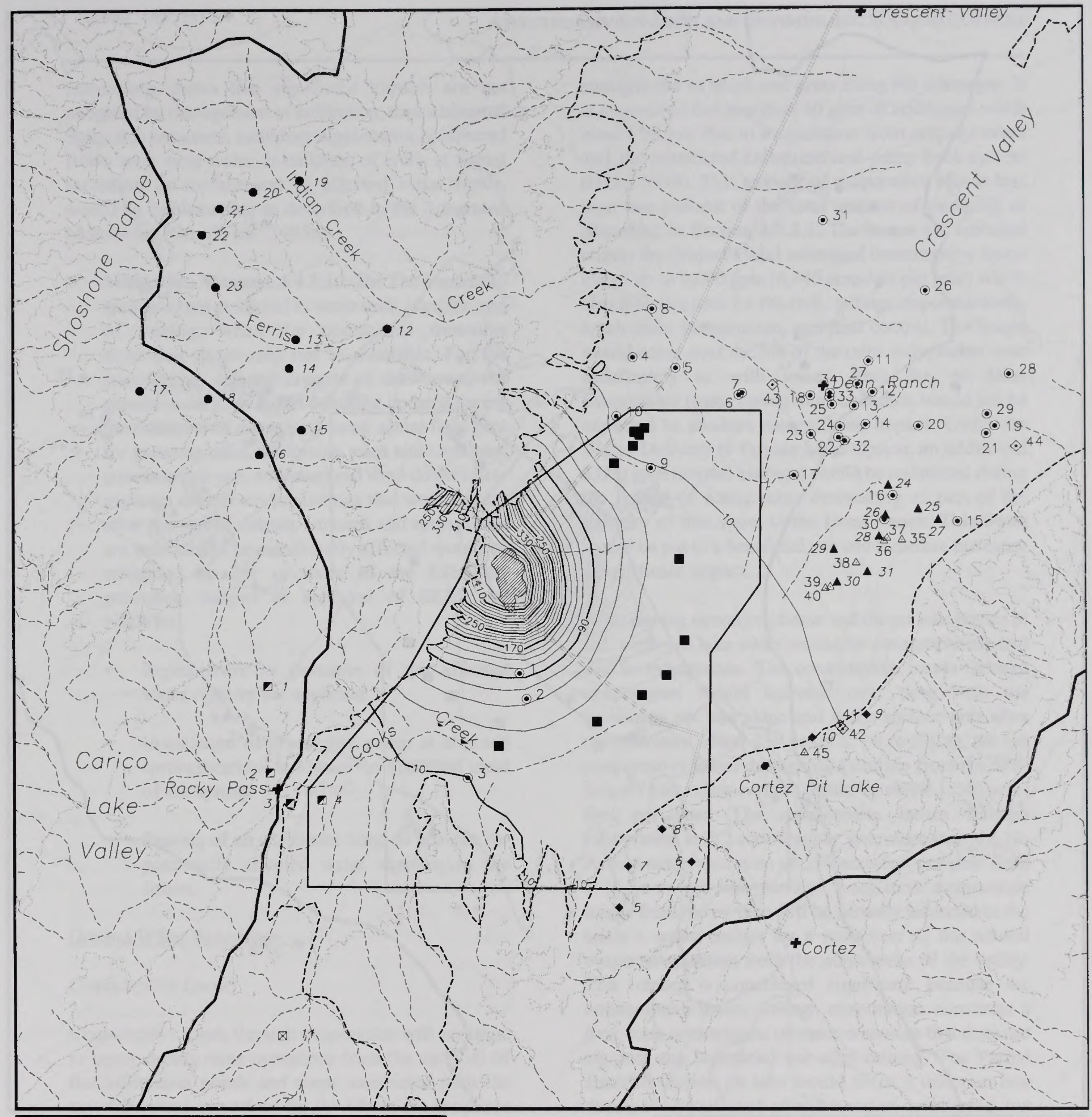
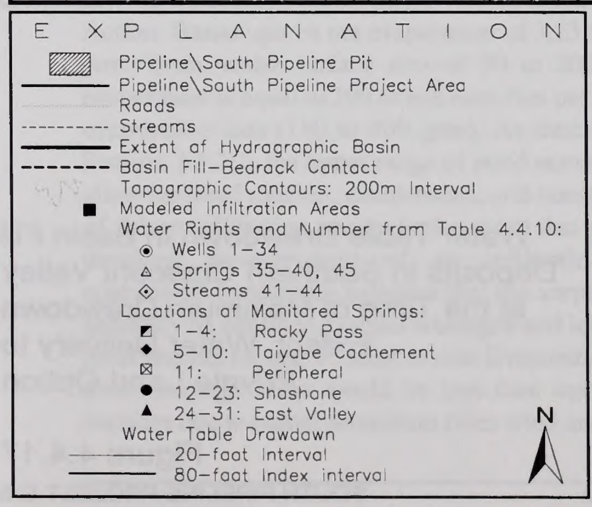
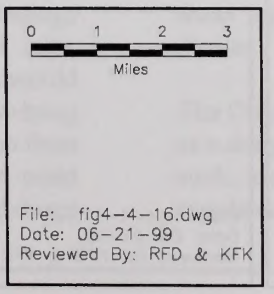
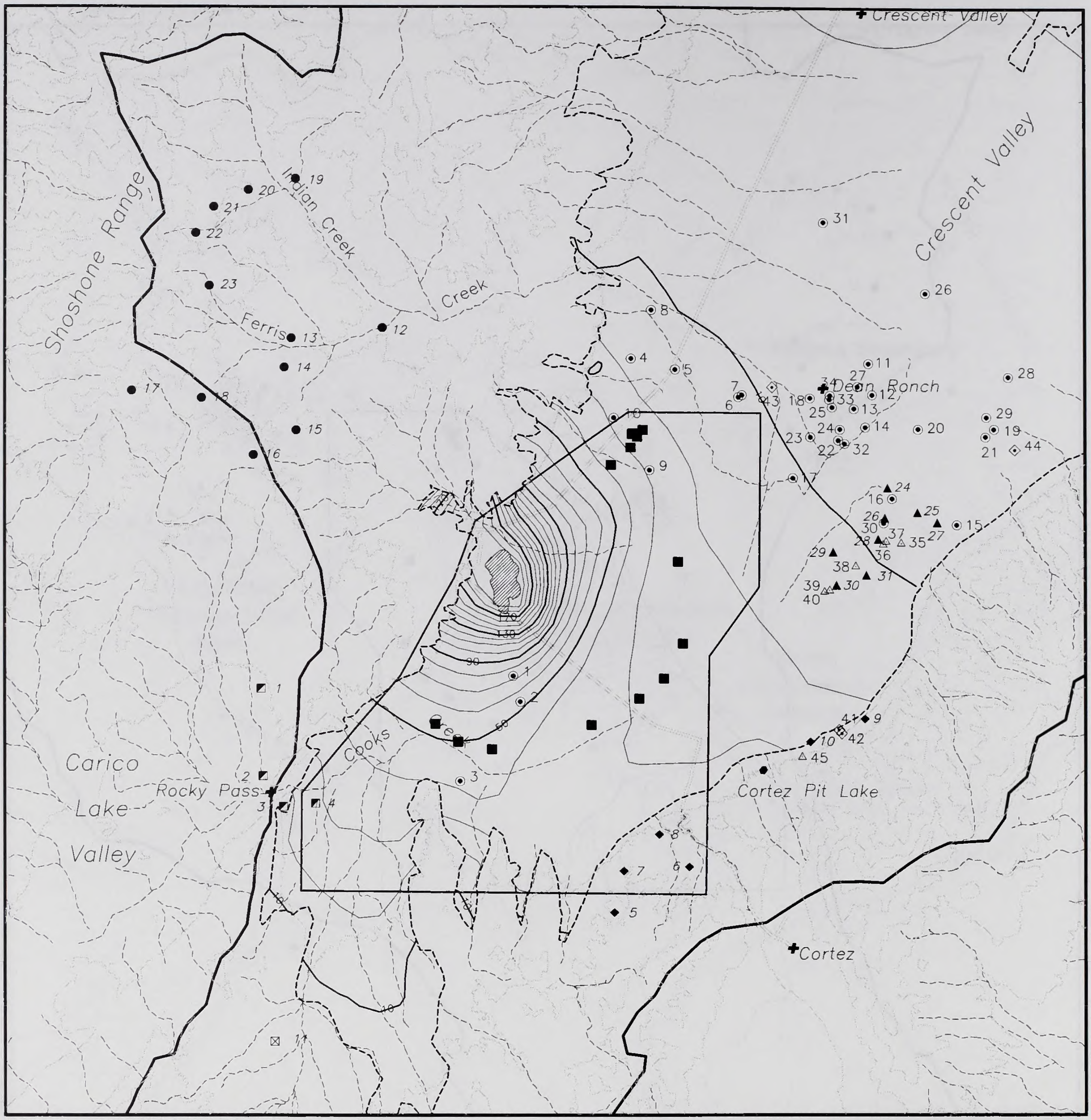


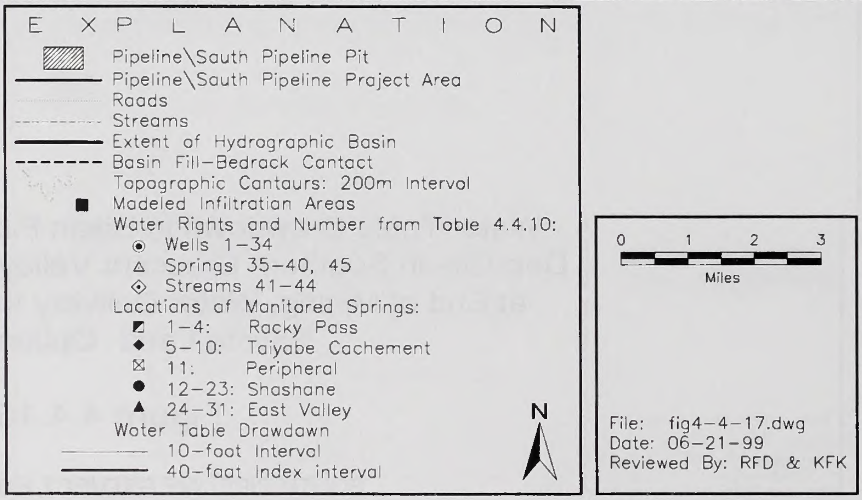




Water Table Drawdown in Basin Fill Deposits in Southern Crescent Valley at End of Mining, Water Delivery to Private Land Option

Figure 4.4.16





Water Table Drawdown in Basin Fill Deposits in Southern Crescent Valley at the Time of Maximum Drawdown Extent, Water Delivery to Private Land Option

Figure 4.4.17

SOUTH PIPELINE PROJECT EIS

monitoring shows that significant impacts are not mitigated by management of infiltration, then additional mitigation measures, including supplementing affected flows with mine water, installation of wells at spring locations, or replacement of affected water rights, would be implemented as described in the Integrated Monitoring Plan (WMC 1995b).

- **Mitigation Measure 4.4.3.3.1-2b:** The impacts to springs is not predicted to occur until after the end of mining, when the operational measures described above may not be available. For the post-mining delayed impacts of drawdown, the ground water flow model would be updated during the final year of dewatering using actual field data for pumping rates, infiltration rates and locations, consumptive use, and observed drawdown to re-evaluate drawdown predictions that would occur after the end of mining. Streams and springs that are indicated to be significantly affected would be mitigated by one or more of the following measures, subject to approval of BLM and NDWR:
  - Replacement or purchase of the affected water right by the applicant.
  - Installation of a well and pump at affected spring locations to restore the historical yield of the spring.
  - Posting of an additional bond to provide for potentially affected water supplies in the future.

Ground Water Resources

Consumptive Losses

Consumptive losses through evaporation will continue to occur during mine operations from the surfaces of the infiltration ponds and seeps associated with the water disposal operations for the life of the Proposed Action. Based upon a net evaporation of 3.23 feet per year, times water surface area of 90 to 200 acres, evaporation is equal to 290 to 646 acre-feet per year of evaporative loss (180 to 400 gpm). As described in Section 2.3.2.1, the upper range of pond acreage is to allow for pond rotation, maintenance, and construction of future infiltration ponds. In the event that seepage develops downgradient of an infiltration site, operational experience indicates that the seeps would generally be confined to small drainages and low-lying areas and not exceed 17 acres in size. Evaporation from these seepage areas would be less than open pond surfaces due to partial protection from wind and direct sunlight due to brush and grass along the drainages. It is reasonable that less than 40 gpm of additional water would be lost due to evaporation from seepage areas and the associated collection and pump back system (BLM 1999). This amount of evaporative loss is less than two percent of the total amount of pumping as described in Section 2.3.2.1. The losses are included within the Project's total estimated consumptive water use of up to 4,000 gpm (6,440 acre-feet per year) which also includes uses for the mill, tailings impoundments, leach pads, revegetation, and dust control. The losses would occur over the life of the mine only, rather than indefinitely as with losses from the pit lake. Evaporative losses during mine operation would not be expected to produce a significant impact. Under the Water Delivery to Private Land Option, an additional 6,000 gpm (annual average) would be consumed during the period of active mine dewatering as part of the delivery of that water to the Dean Ranch. This water would be put to a beneficial use and therefore not cause a significant impact.

After mining operations cease and the pit lake begins to fill, some pit lake water would be consumptively lost due to evaporation. The consumptive losses through evaporation would increase over time with the increasing pit lake stage and water surface area after mine closure. After 250 years of pit re-filling, the net consumptive losses through evaporation from the 385-acre pit lake water surface would be about 1,246 acre-feet per year. The consumptive losses through evaporation is 712 acre-feet per year more than the No Action net evaporation of 534 acre-feet per year from a 163-acre pit lake surface. Long-term evaporation losses from the pit lake will be partially balanced in the basin's water budget by a reduction of the natural evapotranspiration from the playa areas of the valley. The impact is considered significant because the consumptive losses through evaporation constitute a long-term commitment of water resources that does not support any beneficial use after mining. The Partial Backfill Option pit lake would fill at a different rate during the initial years after the end of dewatering, but impacts of these differences are not significantly different from the Proposed Action. Long-term consumptive losses through evaporation under the Partial Backfill Option, the Injection Option, and the Water Delivery to Private Land Option would be similar to the Proposed Action because the ultimate water surface area of the filled pit lake would be similar.

The Crescent Valley Hydrographic Basin is classified as a designated basin by the Nevada State Engineer. As such, the withdrawal and use of ground water is regulated. Evaporative losses may be treated as a

consumptive use and accounted as a water right at the discretion of the Nevada State Engineer. The resulting annual volume of water is comparable to the annual water use allowed for a land parcel of equivalent area placed under irrigation. Because Cortez holds senior certificated water rights for both agricultural and mining/milling uses in Crescent Valley, replacement of evaporative pit lake loss with a certificated water right would result in no net gain in permitted ground water withdrawal or consumptive use from Crescent Valley. The transfer of these water rights to offset the evaporative losses from the pit would render the impacts on water rights insignificant. The Partial Backfill, Injection, and Water Delivery to Private Land options do not result in additional consumptive use impacts beyond those discussed above.

▣ **Impact 4.4.3.3.1-3:** Consumptive use of water by evaporation during mining and delivery of water to the Dean Ranch would support a beneficial use, would not be expected to adversely impact water resources, and CGM would have adequate water rights to cover the consumptive use. Evaporation of 1,246 acre-feet per year from the post-mining pit lake would continue into the foreseeable future after the mine has closed.

Significance of the Impact: Impacts during the active mine life are less than significant. After mining, direct impacts of evaporation do not result in significant impacts, although the long-term consumptive use of water resources that do not contribute to a beneficial use is considered to be a significant impact for which there are no mitigation measures that appear to be feasible.

Lowering of the Water Table Due to Pit Dewatering

The mine dewatering system is designed and operated by CGM to provide relatively dry pit conditions during mining. Pit dewatering would be achieved by pumping ground water from the alluvium and bedrock aquifers and thereby lowering the water table in the vicinity of the proposed open pit. The anticipated maximum annual dewatering pumping rate of 25,150 gallons per minute (gpm) (40,492 acre-feet/year) occurs during year 2 of the dewatering for the existing Pipeline project (Tables 2.3.1 and 3.3.1). The Proposed Action would extend the time-frame of dewatering from 7 years to 13 years. The maximum pumping rate for the Proposed Action is 17,900 gpm and occurs in year 10. As a result, drawdown of the water table is expected to extend to a radius of up to 5 miles beyond the pit area at the end of mining. With the exception of up to 4,000 gpm to be used for the mill, evaporation, and other consumptive uses, as well as the 6,000 gpm (annual average) delivered to the Dean Ranch, the remaining pumped ground water would be returned to the alluvial aquifer via the infiltration ponds, or injection if CGM implements the Injection Option.

The infiltration system is designed to conserve ground water resources by returning the pumped water to the Crescent Valley ground water system. Infiltration also serves to reduce the amount and extent of drawdown due to the pit dewatering. Monitoring of wells located near the proposed open pit, infiltration areas, and regional wells throughout Crescent Valley would be used to evaluate the extent and magnitude of draw-down, and to verify the adequacy of measures taken to reduce drawdown effects. It should, therefore, be possible to effectively reduce potential impacts associated with dewatering drawdown during the period of active mine dewatering by optimizing the location and design of infiltration ponds. The actual locations of infiltration ponds, rates of pumping, and infiltration would be varied throughout the life of the project. The locations of infiltration ponds used in the model are indicated on Figure 4.4.13. The water table elevation would be monitored throughout the life of the operation and after mine closure.

Pit inflow model predictions and dewatering pumping rate estimates have been developed for given conditions of hydrogeology, mine schedule, and mine geometry. For the ground water flow model used in this analysis, uncertainties were reduced by the processes of calibrating the model to two years of operational pumping rates and the observed aquifer responses and by conducting model verification runs and sensitivity analysis of model input parameters (Geomega 1998a). Because of these refinements to the modeling approach, the dewatering rates derived by the ground water flow model for the Proposed Project are less than the pumping rates that were used in previous model results presented in the Pipeline project FEIS (BLM 1996a).

Ground water modeling has been performed to predict the amount and extent of drawdown after 13 years of mine dewatering and infiltration (Geomega 1998a). Figure 4.4.13 shows predicted water table drawdowns in the alluvial aquifer after pumping for 13 years at a rate of up to 25,150 gpm and assuming infiltration at 13 sites. The infiltration rate used in the model is 4,000 gpm less than the pumping rate to account for consumptive water use, evaporation, water retained as storage in the unsaturated zone beneath infiltration ponds, or 10,000 gpm less to account for the 6,000 gpm delivery of water to the Dean Ranch. The maximum drawdown in the pit area during mine operation is expected to be as much as 700 feet.

Potential impacts to ground water users within the area affected by drawdown were evaluated based on this modeling. Modeling results show that significant water table drawdowns in the alluvial aquifer (in excess of 10 feet) would be limited to an area within about 5 miles from the site of the proposed pit at the end of mining (6 miles under the Water Delivery to Private Land Option). Two water rights, well numbers 1 (BLM windmill) and 2 (Filippini) would be affected by more than ten feet of modeled drawdown. The impacts to these two wells is not considered significant because these wells are inactive and because these two wells are similarly affected by the No Action Alternative. Note that the drawdown contours shown extend west only to the limit of the saturated alluvial aquifer. No drawdown contours are shown for the bedrock aquifer because observations, hydrologic investigations, and pumping tests indicate that drawdown in the bedrock will be primarily limited to the hydraulically compartmentalized Gold Acres Window area by geologic structures (i.e., faults and contacts with lower permeability bedrock).

Under the Injection Option, an additional water right, well number 3 (Filippini Windmill), would be affected by more than 10 feet of modeled drawdown. The well is active and therefore the impact is significant.

Under the Water Delivery to Private Land Option, two additional water rights, well numbers 3 (Filippini Windmill) and 9 (Mill Gulch Placer), would be affected by more than 10 feet of modeled drawdown. The impact to well number 3 is considered significant. However, the impact to well number 9 is considered potentially significant. These impacts are further addressed under the *Impacts to Water Rights* section that follows.

Ground Water Level Recovery After The End of Mine Dewatering

The ground water level will begin to recover immediately after active mine dewatering ends. The ground water flow model was used to evaluate water-level recovery for a period of over 250 years after the end of dewatering. Although the model was run at longer time frames into the future to evaluate long-term impacts, it should be understood that modeling uncertainties increase with the longer time frame predictions. The model results indicate a relatively rapid initial period of recovery, with about 83 percent of the drawdown recovered within 50 years after the end of dewatering. After 250 years of recovery, the volume of water in the refilled pit lake is estimated to be about 110,400 acre-feet at about 4,720 feet elevation, or about 75 feet below the pre-mining water level. A near steady-state condition is reached beyond 250 years after mining when the pit water level approaches 4,780 feet in elevation.

During the initial years of water level recovery, the replenishment of water to the dewatered aquifers and filling of the pit lake will draw water from the surrounding saturated portions of the aquifers, including the areas of mounding beneath the former infiltration ponds. As the infiltration mounds dissipate while the pit fills, the lateral extent of the 10-foot drawdown contour will expand somewhat further from the pit than at the end of mining. The maximum extent of the 10-foot drawdown contour is predicted by the model to occur about 20 years after the end of mining (Geomega 1998a). Therefore, the predicted drawdown at 20 years after mining (Figure 4.4.14) is an appropriate time to compare impacts between the Proposed Project and alternatives.

The Injection Option would result in drawdown impacts that are generally similar to the Proposed Project, although based on the location of the injection wells, the extent of drawdown in the southeastern portion of the Project Area is less. In addition, modeling has shown that varying the locations or flow rates of injection wells or infiltration ponds could alter the resulting drawdown contours (Figure 4.4.15) (Geomega 1998a). The Partial Backfill Option would result in drawdown impacts similar to the Proposed Action at the end of mine dewatering, however, the extent of drawdown 20 years after the end of mining is expected to be slightly less because of the smaller water volume needed to fill the backfilled portion of the pit lake (Geomega 1998a). This difference in post-mining drawdown for the Partial Backfill Option has not been quantified, but the difference is expected to be slight, and it is therefore conservatively assumed that the post-mining drawdown of the Partial Backfill Option is the same as the Proposed Action.

The Water Delivery to Private Land Option would result in drawdown impacts greater than that of the Proposed Action or the Injection Option (Figure 4.4.17). The maximum extent would occur approximately 25 years after the end of mining. However, this time frame is sufficiently close to the 20 years for the Proposed Action to allow for comparison to the alternatives.

Impacts to Water Rights

Modeling results indicate some potential for impacts to ground water rights holders in the vicinity of the Project Area. Such impacts may involve lowering of ground water levels at wells or springs. The analysis of

drawdown includes modeling for two time frames - at the end of mine dewatering and at 20 years after the pit begins to refill (25 years for the Water Delivery to Private Land Option). The comparison of significant impacts focuses on the time frame at 20 (25) years after pit refilling. Impacts at known water wells, springs, and water rights sites within about five miles of the Project Area were evaluated for potential water table drawdown as shown on Figures 4.4.14 and 4.4.17). Drawdown under the Proposed Action and the Injection Option was predicted to exceed 10 feet for nine water rights, including two active wells (numbers 3 and 4), five inactive wells (numbers 1,2,5,9, and 10), and two springs (numbers 39 and 40). A list of water rights corresponding to the numbered locations shown on Figure 4.4.11 is included on Table 4.4.10.

The number 3 (Filippini Windmill) and number 4 (CGM) wells are reportedly 130 and 340 feet deep, and drawdown is predicted to be as much as 20 to 40 feet, which could affect the pumping rate from the wells. Since the number 3 well (Filippini Windmill) is reported to be 130 feet deep and the water level at 102 feet deep, with over 30 feet of predicted drawdown 20 years after mining, it is possible that this well may become dry. The number 4 well (CGM) is 340 feet deep and is not expected to become dry as a result of the predicted 10-20 feet of drawdown, however the drawdown could reduce the well's yield. Impacts to water right number 3 is considered to be significant, although since this well is predicted to be significantly affected by the No Action Alternative, the additional impact due to the Proposed Action is negligible. Impacts to well number 4 are not considered significant because CGM controls the water rights.

Water rights for the five inactive wells are not considered significant because these water rights are not active. Four of the five inactive wells would also be drawn down by more than 10 feet by the No Action Alternative. Impacts to the two water rights for springs numbered 39, and 40 are not considered significant because they are controlled by CGM.

Under the Water Delivery to Private Land Option, five additional water rights would be impacted, two active wells (numbers 7 and 17), two inactive wells (numbers 6 and 8), and one spring (number 38). The additional impacts are not considered significant because the water rights for the two active wells and the spring are controlled by CGM and the other wells are inactive.

▣ **Impact 4.4.3.3.1-4:** There are no active water rights that are within the predicted area of the modeled 10-foot drawdown of the valley-fill aquifer that are not otherwise predicted (No Action Alternative) to be significantly affected.

Significance of the Impact: Impacts to the inactive wells are not considered significant until such time as the water rights holder chooses to utilize his rights, at which time they would be considered potentially significant. The impacts would become less than significant after implementation of the following mitigation measures. The significant impacts to three active water supply wells are attributed to the No-Action Alternative and would become less than significant after implementation of the following mitigation measures:

- **Mitigation Measure 4.4.3.3.1-4A:** If regional monitoring shows impacts on water users other than the applicant, impacts should be mitigated by optimizing dewatering well pumping rates and relocation or addition of infiltration ponds. In the event that drawdown effects on water rights users other than the applicant cannot be mitigated based on compliance with applicable Nevada water laws and regulations, the applicant would supplement these users' needs with the appropriate permits from the State for use of water for other than mining.

- **Mitigation Measure 4.4.3.3.1-4b:** For the significant impacts to wells that are not predicted to occur until after the end of mining, the operational measures described above may not be available. For the post-mining delayed impacts of drawdown, the ground water flow model would be updated during the final year of dewatering using actual field data for pumping rates, infiltration rates and locations, consumptive use, and observed drawdown to re-evaluate drawdown predictions that would occur after the end of mining. Wells with active water rights that are indicated to be significantly affected would then be mitigated by one or more of the following measures, subject to approval of BLM and NDWR:

    - Replacement or purchase of the affected water right by the applicant.

    - Installation of a deeper well and pump at affected locations to restore the historical yield of the well.

    - Posting of an additional bond to provide for potential future impacts to potentially affected water supplies.

Ground Water Flow to Humboldt River

Some inflow of ground water into the Humboldt River is believed to occur in the northwestern portion of Crescent Valley. Based upon the basin water budget computed by the numerical ground water flow model (Geomega 1998b), the ground water contribution to the Humboldt River is estimated to be approximately 754 acre-feet per year under baseline conditions (Geomega 1998a). The playa area in the center of the valley is a natural ground water discharge area that accounts for the majority of outflow from the basin and would tend to buffer any effects of dewatering between the proposed mine and the Humboldt River. Since Crescent Valley is a semi-closed basin and the foreseeable mining projects are located over 20 miles from the Humboldt River, previous investigators have concluded that development of ground water resources or mine dewatering would not have a substantial effect on the flow of the Humboldt River (Zones 1961; page 36; and Crompton 1995; figure 7). The anticipated extent of drawdown for the Proposed Action and all options (Figures 4.4.14 and 4.4.17) shows that the effects would be limited to the southern portion of Crescent Valley, and do not extend to within 20 miles of the Humboldt River. However, the modeled effects on the Crescent Valley water balance indicate some effect on ground water contributions to the Humboldt River.

The ground water budgets shown on Figures 4.4.18 and 4.4.19 show a decrease of approximately 190 acre-feet per year change from the baseline ground water budget (Figure 4.4.9) in the Crescent Valley Basin's ground water contribution to the Humboldt River at the end of mine operations. This compares to a decrease of approximately 140 acre-feet per year for the No Action Alternative. As pit refilling begins, the reduced ground water flow to the Humboldt River would continue for the foreseeable future as water in the basin is evaporated by the pit lake and ground water removed from storage is gradually replenished. The relatively small changes in predicted flow to the River would probably be undetectable within the context of natural variability in recharge, evapotranspiration, and ground water flow to the Humboldt River. The predicted reduction in ground water flow to the Humboldt River (190 acre-feet per year for both the Proposed Action and the No Action Alternative combined) represents less than one percent of the 1992 measurements of baseflow and diversions of the Humboldt River at Beowawe. The Proposed Action (and each of the options) would account for approximately 50 acre-feet per year of the decrease in flow to the Humboldt River. The small magnitude of predicted impact to the flow of the Humboldt River illustrates the buffering effect of the playa and indicates that the Proposed Action would not result in significant direct or cumulative impacts on the Humboldt River.

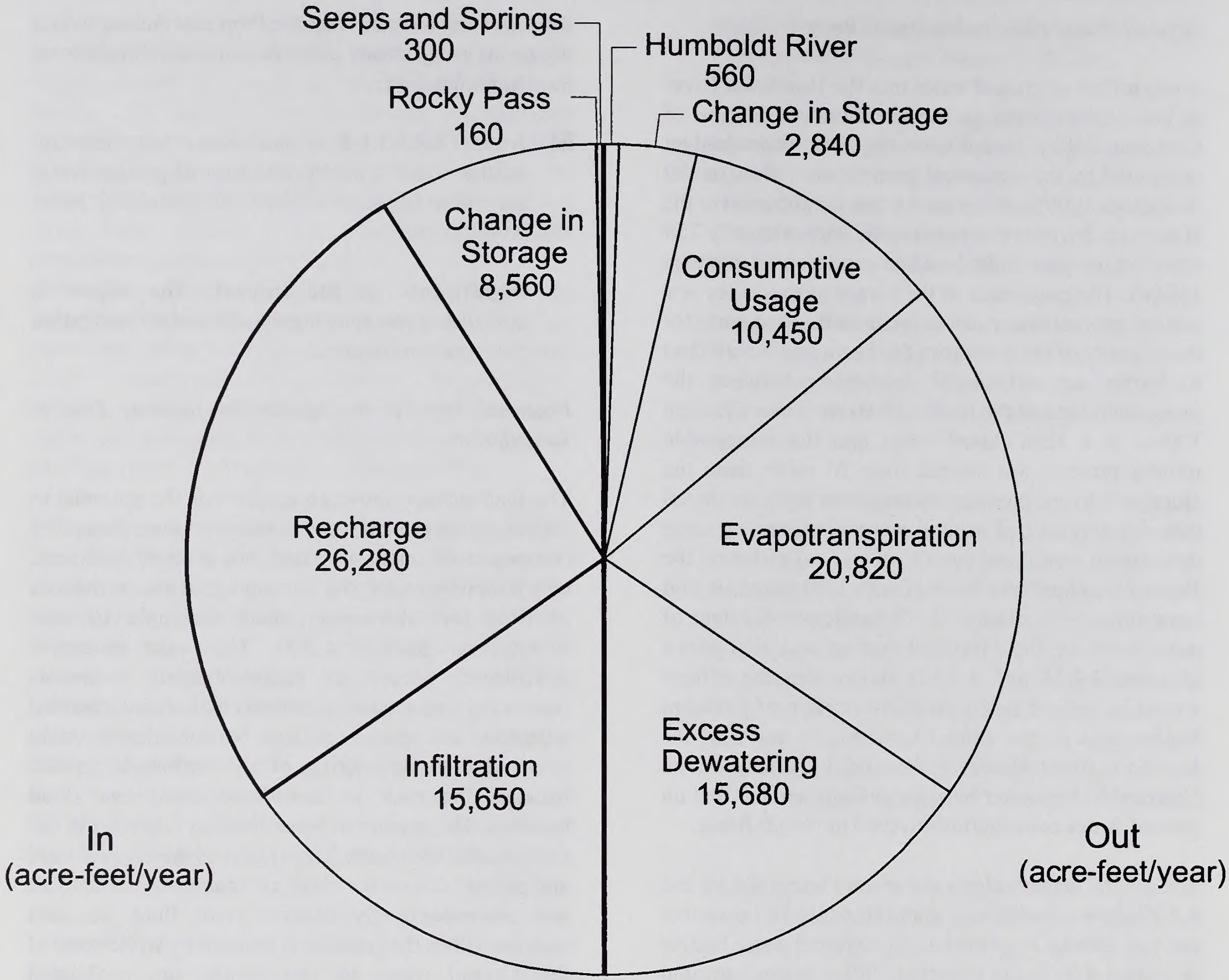
▣ **Impact 4.4.3.3.1-5:** Ground water flow modeling indicates that a slight reduction of ground water flow from Crescent Valley to the Humboldt River would occur.

Significance of the Impact: The impact is considered less than significant and no mitigation measures are required.

Potential Impacts to Aquifer Productivity Due to Subsidence

The land surface above an aquifer has the potential to subside when ground water is removed from an aquifer composed of unconsolidated fine-grained sediment, which thereby undergoes consolidation due to the loss of fluid (see discussion under Geologic Hazards Impacts in Section 4.2.3). The most extensive subsidence occurs in unconsolidated sediments containing fine-grained sediments that are interbedded with sand and gravel aquifers. No subsidence would occur due to dewatering of the carbonate aquifer because the rock is considered competent (load bearing). The amount of consolidation is greater in the fine-grained sediments (clays) than in the coarser sand and gravel because the clays are much more absorbent and correspondingly contain more fluid per unit volume. When the pressure is reduced by withdrawal of the ground water by dewatering, unconsolidated materials undergo compaction, which is often irreversible. Typically, only a small part of the compression is reversible during ground water level recovery.

An analysis of the potential impacts to aquifer consolidation was performed using the interbed-storage package for MODFLOW (Leake and Prudic 1988) along with ground water flow modeling for the Proposed Action (Geomega 1998a). The Project Area is situated on the western margin of Crescent Valley and is underlain by a wedge of alluvium that overlies easterly dipping bedrock. Only a small portion of the alluvium is saturated with ground water underneath the pit, but this increases to the east toward the center of the valley. The saturated thickness of the alluvium increases from approximately 90 feet at the pit to over 700 feet at a distance of 5,000 feet to the east of the pit. The alluvial aquifer which will become dewatered consists of silty sands and gravel, clayey sands, and sandy clay.



	In	Out
Recharge	26,280	0
Evapotranspiration[1]	0	20,820
Consumptive Usage	0	10,450
Infiltration/Excess Dewatering	15,650	15,680
Change in Storage	8,560	2,840
Humboldt River	0	560
Seeps and Springs	0	300
Rocky Pass	160	0
Total	50,650	50,650

[1] Computed evapotranspiration rate was adjusted by approximately 2% to achieve a closing water balance.

EXPLANATION

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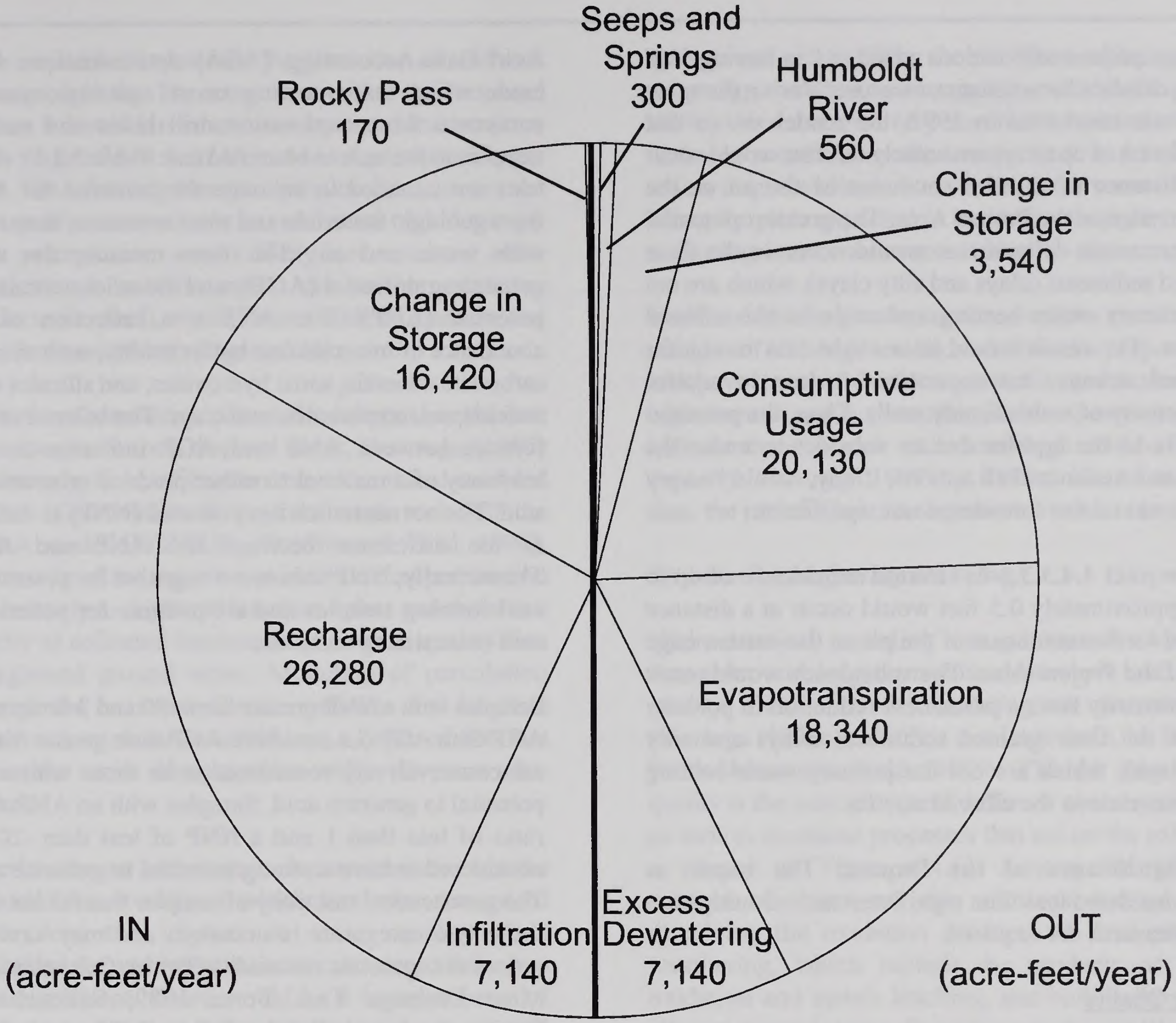
Date: 06-21-99
Reviewed By: RFD & KFK

Ground Water Budget of Crescent Valley Hydrographic Basin at End of Mining, Proposed Action

Figure 4.4.18

SOUTH PIPELINE PROJECT EIS



	In	Out
Recharge	26,280	0
Evapotranspiration[1]	0	18,340
Consumptive Use	0	20,130
Infiltration/Excess Dewatering	7,140	7,140
Change in Storage	16,420	3,540
Humboldt River	0	560
Seeps and Springs	0	300
Rocky Pass	170	0
Total	50,010	50,010

1 Computed evapotranspiration rate was adjusted by approximately 5% to achieve a closing water balance.

E X P L A N A T I O N

File: fig4-4-19.dwg
Date: 06-21-99
Reviewed By: RFD & KFK

Ground Water Budget of Crescent Valley Hydrographic Basin at End of Mining, Water Delivery to Private Land Option

Figure 4.4.19

Using aquifer compositions observed in boring logs and hydraulic characteristics measured during pumping well tests conducted in 1992, the model shows that subsidence of up to approximately 0.5 feet would occur at a distance of 4 miles southeast of the pit on the eastern edge of the Project Area. The greatest potential for permanent deformation would occur in the finer grained sediments (clays and silty clays), which are not the primary water-bearing materials in the alluvial aquifer. The result would be a slight loss in aquifer interbed storage, but no noticeable loss in aquifer productivity of water supply wells. Thus, the potential impacts to the aquifer due to subsidence under the Proposed Action and all options, if any, would be very localized and are considered not significant.

▣ **Impact 4.4.3.3.1-6:** Ground subsidence of up to approximately 0.5 feet would occur at a distance of 4 miles southeast of the pit on the eastern edge of the Project Area. The subsidence would result primarily from a permanent reduction in porosity in the finer grained sediments (clays and silty clays), which are not the primary water-bearing materials in the alluvial aquifer.

Significance of the Impact: The impact is considered less than significant and no mitigation measures are required.

Water Quality

Water Quality Degradation Due to Drainage from Ore Stockpiles and Waste Rock

A general impact from mines to surface water and ground water quality could result from stockpiled ore and waste rock piles. Interaction of infiltrating water with mining-related wastes could result in low pH effluent, commonly called acid rock drainage (ARD). ARD generally results from the oxidation of pyrite or similar compounds. Even neutral pH leachates may have elevated concentrations of dissolved constituents because mining activities increase the surface area of minerals available for reaction with water and air. It should be noted that ARD, both depressed pH and elevated metal and other constituent concentrations, can develop from the natural weathering of mineralized rock. Natural ARD may also impact local surface and ground water quality. If leachates reach the water table, concentrations of certain compounds in ground water could increase, resulting in exceedances of NDEP standards. Leachates derived from ore or waste rock can impact surface waters by transporting and depositing metals and other constituents in near-surface sediments within the drainages near the project site.

Acid Base-Accounting (ABA) determinations were made using static testing on 47 geologic sample composits from exploration drill holes and surface samples in the area to be mined (see Table 3.2.1). ABA tests are intended to estimate the potential for ARD from geologic materials and mine wastes as they react with water and air. The tests measure the acid-generating potential (AGP), and the acid-neutralizing potential (ANP). The ANP is a reflection of the abundance of minerals that buffer acidity, such as most carbonate minerals, some hydroxides, and silicates such as feldspars, amphiboles, and clays. The balance or difference between ANP and AGP indicates the net tendency of a material to either produce or neutralize acid. The net neutralization potential (NNP) is defined as the difference between the ANP and AGP. Theoretically, NNP values are negative for potentially acid-forming samples and are positive for potentially acid-neutralizing samples.

Samples with a NNP greater than +20 and 3 times more ANP than AGP (i.e., an ANP:AGP ratio greater than 3) are conservatively considered to be those with a low potential to generate acid. Samples with an ANP:AGP ratio of less than 1 and a NNP of less than -20 are considered to have a strong potential to generate acid. The geochemical reactivity of samples that fall between these two categories is uncertain and may have the potential to generate net acidity (British Columbia Acid Mine Drainage Task Force 1989; Saskatchewan Environment and Public Safety 1992; and BLM 1996a). The criteria should be considered as rough guidelines for prediction of net acid generation from specific geologic materials. BLM's ARD policy requires the use of kinetic tests where static tests indicate potential or uncertain potential to generate ARD based on the static ABA tests.

All samples of material in Table 3.2.1 had high neutralization potential versus acid-generating potential, i.e., ANP/AGP greater than 3. All but two of the samples (SPM-5 and SPM-7) had NNP greater than 20 (low potential to generate ARD). The two samples with NNP less than 20 (uncertain potential to generate ARD) are samples of silicified siltstone and sheared zones that would be classified as ore to be processed, and thus would not be present in significant quantities in the waste rock. Kinetic testing was performed to further evaluate potential ARD and leachate characteristics under longer term tests that more accurately represent field conditions than the static tests. Results of 25 humidity cell tests each indicate alkaline leachate with low analyte concentrations (Geomega 1997). Thus, it is unlikely that any of the geologic materials tested will generate ARD.

With respect to the potential for generation of acid rock drainage, it is also important to note that the Proposed Action is located in an arid environment that receives an average of less than 10 inches of precipitation per year. The relatively low precipitation rate reduces the amount of water available to cause acid rock drainage. Less precipitation would likely not result in more concentrated leachate since less sulfide oxidation products (i.e. acid), would be available to dissolve and mobilize constituents (e.g. metals).

To further characterize potential water quality impacts from the waste rock disposal areas, Geomega (1997) conducted a field infiltration experiment and modeled the rate of percolation through the waste rock with the USDA model HYDRUS_2D (Simunek et al. 1996). The results of the experiment indicate that percolation reaches only to depths of less than 4 feet and the water quality of collected leachate is of a better quality than background ground water. Modeling of percolation through the unsaturated zone indicates that leachate would not reach the water table at a depth of 540 feet below the waste dump surface within 40 years after closure.

Based on the ore and waste rock characteristics and the arid climatic conditions which limit the amount of infiltration, the impacts to water quality from stockpiled ore and waste rock are considered to be less than significant. There would be a lower volume of waste rock placed in the waste piles under the Partial Backfill Option, this difference would not be significant regarding water resources impacts of the waste rock piles. The Injection and Water Delivery to Private Land options would not otherwise result in impacts to water quality due to draining from ore stockpiles and waste rock.

▣ **Impact 4.4.3.3.1-7:** There would be a low potential for impacts to surface water and ground water quality due to drainage from stockpiled ore and waste rock piles.

Significance of the Impact: The impact is considered less than significant and no mitigation measures are required.

Pit Lake Water Quality

After the ore body has been exhausted and mining operations cease, ground water would eventually fill the mine pit to an elevation approaching the prior surrounding water table elevation, forming a pit lake. Because acid-generation and concomitant solute release from pit wall rock is not likely, pit lake water quality will be primarily influenced by evaporation of background water filling the pit. The coupled ground water flow and pit water quality models (Geomega 1998c) show that over 60 percent of the pit inflow will be from the calcareous siltstone bedrock and 5 percent or less from the alluvium. As a result, the water initially filling the pit is expected to be similar in quality to the bedrock ground water surrounding the pit.

Static and kinetic geochemical test results showed that samples of alluvium and bedrock from the proposed pit area have low acid-producing potential and moderate to high neutralization potential. Field experiments also indicate that the rock walls have high acid-buffering capacity (Geomega 1997 and 1998c). Based on these data, the pit lake has a low potential to become acidic.

Pit Lake Water Quality Modeling

Hydrochemical modeling was performed to predict near-term and long-term post-closure pit lake water quality. Details of the modeling are presented in Geomega (1998c), which is available from the BLM's Battle Mountain Field Office. The pit lake water quality is the sum of several different sources of water as well as chemical processes that act on the solution, as shown on Figure 4.4.12. Among the different sources of water are the solutions derived from dissolving the oxidation products of final pit wall weathering, which include the products of pyrite oxidation and metals leaching, and both bedrock and alluvial ground water. Over time, as the pit lake fills, evaporation of water from the pit lake surface will concentrate dissolved constituents in solution, and precipitation and adsorption will remove some dissolved constituents from the pit lake water. The nature of the chemical reactions, in turn, will be controlled by such variables as temperature, interaction with the atmosphere, stratification of the pit lake, and the prevailing oxidation conditions within the lake. The analysis and modeling indicate that evapoconcentration over time is the dominant factor affecting the geochemical evolution of post-mining pit lake water quality. Evapoconcentration is quantified by calculation of an evapoconcentration factor, representing the ratio of the total volume of water entering the pit to the volume of the lake after evaporative losses.

Predicted post-mining pit water quality is shown in Table 4.4.12 for periods up to 250 years post-closure. At 1 year post-closure, the pit water is predicted to be alkaline, pH 7.6, with generally low constituent concentrations that meet Nevada water quality standards, with the exception of fluoride (2.96 mg/L) and TDS (787 mg/L) concentrations which exceed the secondary standards. At 250 years post-closure, fluoride (4.18 mg/L) and TDS (1056 mg/L)

Table 4.4.12: Model-Predicted Solute Concentration at Selected Years for the Proposed Action

	Years After End of Mining						
Analyte	**1**	**5**	**10**	**50**	**100**	**200**	**250**
Calcite	0.000	3.870	7.291	19.154	25.877	34.551	38.152
Ferrihydrite	0.205	0.487	0.670	0.933	1.044	1.161	1.197
Barite	0.114	0.260	0.394	0.594	0.671	0.737	0.753
Gibbsite(C)	0	0	0	0	0	0	0
pH	7.614	8.123	8.157	8.206	8.21	8.217	8.222
TDS	787	794	801	864	920	**1006**	**1056**
Alkalinity	302	287	274	265	269	275	279
Aluminum	0.019	0.017	0.014	0.015	0.016	0.017	0.018
Antimony	0.0030	0.0033	0.0036	0.0046	0.0049	0.0054	0.0057
Arsenic	0.018	0.019	0.019	0.022	0.024	0.026	0.028
Barium	0.011	0.010	0.009	0.008	0.008	0.007	0.007
Beryllium	1.33E-06	9.85E-07	3.84E-06	1.49E-06	2.52E-06	2.20E-06	1.84E-06
Cadmium	0.0006	0.0006	0.0006	0.0008	0.0008	0.0009	0.0010
Calcium	71	69	68	65	65	65	64
Chlorine	73	76	81	97	107	123	132
Chromium	0.0047	0.0070	0.0062	0.0085	0.0098	0.0114	0.0122
Copper	0.0029	0.0031	0.0031	0.0036	0.0038	0.0041	0.0044
Fluorine	2.96	2.97	2.92	3.21	3.49	3.91	**4.18**
Iron	0.0004	0.0003	0.0004	0.0004	0.0004	0.0004	0.0004
Lead	0.0009	0.0011	0.0011	0.0016	0.0017	0.0019	0.0020
Magnesium	27	28	29	34	37	42	45
Manganese	0.046	0.049	0.053	0.064	0.069	0.076	0.080
Mercury	3.67E-05	1.99E-05	1.49E-05	1.58E-05	1.70E-05	1.91E-05	2.03E-05
Molybdenum	0.014	0.015	0.015	0.018	0.020	0.022	0.024
Nickel	0.006	0.009	0.008	0.012	0.014	0.016	0.017
Nitrate	1.165	1.251	1.294	1.455	1.583	1.779	1.911
Potassium	16	16	16	18	20	22	24
Selenium	0.0012	0.0012	0.0011	0.0016	0.0017	0.0019	0.0021
Silver	0.0008	0.0008	0.0007	0.0011	0.0011	0.0013	0.0014
Sodium	111.501	115.501	119.11	136.536	149.503	169.55	181.367
Sulfate	182	197	209	244	267	305	325
Thallium	0.0010	0.0009	0.0008	0.0008	0.0009	0.0010	0.0011
Vanadium	0.0012	0.0011	0.0011	0.0011	0.0012	0.0014	0.0015
Zinc	0.016	0.014	0.013	0.026	0.025	0.023	0.023
Evapoconcentration Factor	1.02	1.10	1.16	1.36	1.58	1.93	2.13

Use of one-half detection limits as a proxy for solutes not detected in ground water or leaching tests resulted in predicted concentrations for Ag, Al, Be, Cd, Cr, Ni, Pb, Se, Tl, and V that may be higher than actually occurs.

Concentrations in mg/L; pH in standard units; solid phase precipitate values are cumulative.
Exceedances of enforceable drinking water standards are shown in bold-face type.

concentrations are predicted to exceed the Nevada water quality standards.

By comparison with the No Action Alternative, the Proposed Action pit lake would be larger with a greater surface area to volume ratio, which would result in a higher evapoconcentration factor over time. At 250 years after mining, the evapoconcentration factor is 2.13 for the Proposed Action versus 1.34 for the No-Action Option. Although the No-Action Alternative and Proposed Action pit water qualities are similar during the first years of filling, after 250 years the No-Action Alternative would still be predicted to meet Nevada water quality standards with a TDS concentration of 792 mg/L.

Partial backfill of the open pit is considered as an option to the Proposed Action. The Partial Backfill Option would result in a different pit lake water quality because of the increased volume of porous material (primarily calcareous siltstone waste rock) that would be subject to leaching in the pit lake that would result in slightly higher initial concentrations of water quality constituents than the Proposed Action. The difference is illustrated by the year 1 concentrations for the pit lake shown in Table 4.4.13 (TDS of 817 mg/L) compared to Table 4.4.12 for the Proposed Action (year 1 TDS of 787 mg/L). Long-term pit lake water quality will also be different for this option due primarily to the larger ratio of lake surface to volume with the pit lake surfaces for the Proposed Action and Partial Backfill Option having the same evaporative surface area while the backfilled waste rock diminishes the volume of the latter pit lake. Therefore, the Partial Backfill Option pit lake will have a higher evapoconcentration factor because, while it has a smaller volume than the Proposed Action pit lake, it experiences the same volume of evaporative loss. At 250 years after mining, this results in an evapoconcentration factor of 3.79 for the Partial Backfill Option versus 2.13 for the Proposed Action. For the Partial Backfill Option at 250 years post-closure, antimony (0.0073 mg/L), fluoride (5.40 mg/L), manganese (0.107 mg/L), and TDS (1,309 mg/L) concentrations are predicted to exceed the Nevada water quality standards.

The Water Delivery to Private Land Option would not result in a substantially different pit filling scenario than that of the Proposed Action (Geomega 1999). The Injection Option would not otherwise result in impacts to the pit filling scenario (Geomega 1998a).

Without supporting site-specific data, the utility of hydrochemical models as predictive tools is primarily qualitative. However, because the future water quality of the South Pipeline Pit Lake would be predominantly influenced by evaporation of ground water, and because water and sediment chemistry in the analogous Cortez Pit Lake was available for analysis, model uncertainty was reduced by the collection, calibration to, and incorporation of relevant, site-specific data. The tasks included the quantification of evolving water quality of evaporating ground water by a field test and the identification of specific aqueous geochemical reactions taking place in pit water by analyses of the Cortez Pit Lake sediment and water. In addition, the sensitivity analyses conducted on the hydrogeochemical model (Geomega 1998c, Appendix F) give a reasonable estimate of the remaining uncertainty in predicted analyte concentrations due to hydrogeochemical modeling assumptions for this complex interactive system.

In general, the predicted Pipeline pit lake chemistry would be expected to evolve over time to approach that of many of the natural lakes of the arid western United States where evaporation is a dominant process, as shown in the Pipeline project FEIS, Table 4.4-6 (BLM 1996a). All are alkaline, with pHs often above 9.0 and TDS concentrations usually above 3,000 to 5,000 mg/L.

The predicted pit lake solute concentrations are comparable to other Nevada pit lakes with good water quality (BLM 1996a, Table 4.4-7; Miller et al. 1996, Davis and Eary 1997). For example, sulfate, pH, TDS, and other major ion concentrations are similar to observed concentrations in the Yerington pit lake (Miller et al. 1996, Table 1), while manganese, mercury and other metal concentrations fall within the range observed in the Cortez and Yerington pit lakes.

NDEP regulations (NAC 445A.446) limit post-closure monitoring to 30 years or less. NDEP staff currently consider 5-year plans with annual assessment of monitoring needs. The POO provides for an evaluation of pit lake water quality and monitoring of ground water quality in the vicinity of the pit. Samples of pit lake water and ground water samples in monitoring wells surrounding the proposed pit lake would be collected and analyzed for NDEP Profile 1 parameters, 36 metals, total suspended solids, and turbidity at least quarterly to document water quality. NDEP aquatic toxicity standards apply only to classified surface waters (i.e., perennial streams) and would not be applicable to the pit lake water quality. According to NDEP guidance, aquatic standards are not applied to mining project waters; therefore, standards for human health (drinking water, NDEP Profile 1) and avian and terrestrial water quality standards would be applicable.

Table 4.4.13: Model-Predicted Solute Concentration at Selected Years for the Partial Backfill Option

	Years After End of Mining						
Analyte	**1**	**5**	**10**	**50**	**100**	**200**	**250**
Calcite	0.000	3.979	6.685	20.160	30.853	47.162	53.874
Ferrihydrite	0.192	0.396	0.502	0.777	0.922	1.132	1.213
Barite	0.096	0.189	0.233	0.315	0.350	0.391	0.403
Gibbsite(C)	0	0	0	0	0	0	0
pH	7.623	8.153	8.173	8.224	8.236	8.255	8.265
TDS	817	791	786	896	**1022**	**1212**	**1309**
Alkalinity	307	275	269	270	281	300	309
Aluminum	0.011	0.009	0.009	0.011	0.014	0.017	0.019
Antimony	0.0035	0.0033	0.0033	0.0043	0.0052	**0.0066**	**0.0073**
Arsenic	0.025	0.021	0.020	0.025	0.029	0.037	0.041
Barium	0.010	0.010	0.010	0.008	0.007	0.006	0.006
Beryllium	1.84E-06	8.60E-07	7.77E-07	5.26E-07	5.86E-07	4.87E-07	4.61E-07
Cadmium	0.0005	0.0005	0.0006	0.0007	0.0009	0.0011	0.0012
Calcium	77	68	66	62	61	58	57
Chlorine	75	81	83	105	127	160	177
Chromium	0.0074	0.0059	0.0054	0.0053	0.0055	0.0060	0.0064
Copper	0.0040	0.0043	0.0044	0.0058	0.0071	0.0089	0.0099
Fluorine	2.66	2.64	2.64	3.26	3.89	**4.86**	**5.40**
Iron	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004
Lead	0.0015	0.0013	0.0013	0.0018	0.0022	0.0028	0.0031
Magnesium	29	30	30	38	45	57	63
Manganese	0.066	0.064	0.064	0.073	0.083	0.098	**0.107**
Mercury	1.09261E	8.90E-05	9.00E-05	1.23724E	0.000156	2.03198E	2.23257E
Molybdenum	0.027	0.023	0.023	0.033	0.043	0.057	0.065
Nickel	0.0072	0.0056	0.0051	0.0049	0.0049	0.0054	0.0057
Nitrate	0.765	0.740	0.728	0.875	1.036	1.297	1.437
Potassium	16	16	16	20	24	30	34
Selenium	0.0006	0.0006	0.0006	0.0009	0.0011	0.0014	0.0015
Silver	0.0006	0.0005	0.0005	0.0006	0.0008	0.0010	0.0011
Sodium	113	115	115	143	172	216	239
Sulfate	199	203	204	254	306	384	425
Thallium	0.0006	0.0006	0.0006	0.0008	0.0010	0.0013	0.0014
Vanadium	0.0016	0.0012	0.0011	0.0011	0.0014	0.0016	0.0017
Zinc	0.016	0.015	0.015	0.017	0.019	0.022	0.023
Evapoconcentration Factor	1.02	1.08	1.12	1.54	2.08	3.10	3.79

Concentrations in mg/L; pH in standard units; solid phase precipitate values are cumulative.
Use of one-half detection limits as a proxy for solutes not detected in ground water or leaching tests resulted in predicted concentrations for Ag, Al, Be, Cd, Cr, Ni, Pb, Se, Tl, and V that may be higher than actually occurs.
Exceedances of enforceable drinking water standards are shown in bold-face type.

Impacts Due to Poor Pit Lake Water Quality

Initial pit lake water quality is predicted to be quite good and would meet Nevada enforceable drinking water standards. As evaporation from the lake surface concentrates the dissolved minerals, some water quality constituent concentrations would be predicted to increase over time relative to baseline concentrations and to exceed the present Nevada water quality standards (see Tables 4.4.11 and 4.4.12). The pit lake would be a water of the State of Nevada, and applicable water quality standards would depend on the present and potential beneficial uses of the lake. Access to the open pit by humans and livestock would be restricted. The lake is not intended to be a drinking water source for humans or livestock or to be used for recreational purposes. Therefore, standards to protect these beneficial uses would not be directly applicable. Aquatic standards would also not be applicable since CGM does not plan to have the pit lake stocked with fish. Exposure to avian species is discussed in Section 4.9.3.

Although it is concluded that present beneficial uses described above would not apply to the pit lake, Nevada law prohibits the creation of pit lakes that have potential to degrade waters of the State (NAC 445A.249). However, waters of the State are not considered degraded until it has been demonstrated that water quality trends have stabilized and at that time do not meet standards. As such, the trend would need to be permanent before the impact would be significant.

After the pit lake fills, some ground water may migrate from the pit into the surrounding aquifer. Prior to mine dewatering, ground water in the proposed pit area flowed in an easterly or southeasterly direction. After filling of the pit lake, ground water may enter the pit lake on the upgradient (west) side and leave the lake by entering the ground water system on the downgradient (east) side of the lake. If the pit water quality constituent concentrations increase as predicted, some ground water quality constituent concentrations downgradient (east) of the pit could also increase. Because of the net annual water loss from the pit lake, the pit lake is expected to act as a ground water sink for over 250 years after mining. As the pit lake approaches hydraulic steady-state conditions beyond 250 years after mining, approximately 36 acre-feet per year is calculated to flow from the pit lake into the adjacent ground water (Geomega 1998d). This long-term prediction, however, should be considered with the caution that the model predictions uncertainties increase with the extrapolation of predictions to greater times into the future. It should also be understood that application of a similar analysis to virtually any consumptive use of ground water resources (e.g. irrigation, municipal, industrial, domestic) over an extended time frame would result in concentration of dissolved constituents and degradation of ground water quality over time. Therefore, there is a long-term potential for an increase in the concentrations of some ground water quality constituents due to pit water seepage. The areal extent of such concentration increases is uncertain; however, constituent concentrations would likely diminish with distance from the pit lake.

▣ **Impact 4.4.3.3.1-8:** The predicted pit water quality would initially be good. With time, evapoconcentration is predicted to increase constituent concentrations, eventually exceeding enforceable drinking water standards approximately 190 years after the end of mining (90 years under the Partial Backfill Option). As evaporation concentrates pit waters over time, the quality would generally resemble that of natural closed basin lakes in an arid climate. Acidic mine waters are not predicted to develop. Potential migration of pit waters into the adjacent aquifers would not occur until a hydraulic steady-state condition is approached, beyond 250 years after the end of mining.

Significance of the Impact: The significance of pit water quality impacts is time dependant. Over the normal time frame of post-closure monitoring and maintenance (30 years), impacts are less than significant. Long-term impacts are considered to be potentially significant because of the increasing uncertainty of extending predictions into the future. No mitigation measures appear to be feasible for potential long-term impacts, however a long-term contingency fund has been established by CGM and BLM (BLM 1996a, Section 2.2.8). This fund will be used at the BLM's discretion for long-term monitoring, and to provide for a program of corrective action, using the best available technology, should long-term monitoring indicate the need to take such action.

Ground Water Quality in the Reinfiltration Areas

Potential impacts to ground water quality could result from poor-quality infiltration water, or from degradation of infiltration water as it percolates through the alluvium to the water table. The dewatering system would remove ground water from the proposed pit area and infiltrate it into several infiltration ponds. Infiltration water (i.e., ground water pumped from the pit area) is expected to be a mixture of water from alluvial and bedrock sources. The dewatering water is

predicted to generally meet Nevada water quality standards for all parameters. At modeling period 200 and 250 years, TDS and iron show slight exceedances. Given the natural variability of the baseline data, variable water quality may be encountered in some zones and over time during the course of mine operations. To date, impacts from water quality have been exclusively related to degradation of infiltration water as it percolates through the alluvium.

While the dewatering discharge is expected to generally meet drinking water standards, it is expected that reinfiltrated water may be degraded by dissolving soluble constituents in the previously unsaturated alluvium. Monitoring of ground water quality at active infiltration sites for the existing Pipeline project indicate that the quality of infiltrated waters may initially exceed the Nevada water quality standards for selected constituents (primarily TDS, sulfate, and chloride) as a result of the infiltration activities. It is unlikely that such changes in water quality would affect the existing beneficial uses for these ground waters because of the localized areas affected (Geomega 1998f) and the temporary nature of the impact (Geomega 1998b).

Applicant-committed practices include evaluation of geochemical data, ongoing monitoring of infiltration water quality, and ground water quality monitoring to verify that the preliminary assessments are correct. On the basis of these monitoring data to be collected during mine operation, impacts to water quality due to infiltration of water pumped from the pit would be evaluated. There is a potential for impacts to ground water quality in the infiltration areas due to dissolution of evaporite minerals as water passes through the alluvium to the aquifer. The Injection, Partial Backfill, and Water Delivery to Private Land options would not otherwise result in impacts to groundwater quality in the reinfiltration areas.

▣ **Impact 4.4.3.3.1-9:** It is possible that infiltrated water may temporarily exceed the Nevada water quality standards for selected constituents as a result of either poor quality of pumped ground water or dissolution of saline soils beneath the infiltration ponds.

Significance of the Impact: This impact is considered potentially significant. The following mitigation measures would reduce the impact to less than the level of significance.

- **Mitigation Measure 4.4.3.3.1-9a:** In the event monitoring shows that reinfiltration water is of sufficiently poor quality to degrade ground water beneath the infiltration ponds (e.g., raise TDS levels to greater than applicable standards for existing or potential beneficial uses), then mitigation measures would include chemical pretreatment such as flocculation basins to reduce TDS in water flowing into infiltration areas.

- **Mitigation Measure 4.4.3.3.1-9b:** If ground water quality is degraded by infiltration through saline soils in the vadose zone, then the following mitigation measures would be undertaken:

  - The bottom surface of individual basins within the source infiltration area would be modified by installation of trenches or borings intended to provide access to deeper coarse-grained alluvial sequences underlying the site. The trenches and borings would be backfilled with clean gravel to provide wall stability and promote vertical drainage, resulting in a more direct flow path to the body of receiving water and would decrease contact time with the upper, fine-grained minerals, the source of mobilized salts.

  - Alternative infiltration sites would be used.

  - Implementation of the Injection Well Option (described in Section 3.3.2.3) may also be used to avoid impacts associated with infiltration through saline soils.

4.4.3.3.2 Residual Adverse Impacts

Residual adverse impacts of the Proposed Action would include the following:

- Long-term consumptive water use: Evaporation of water from the post-mining pit lake is estimated to amount to 1,246 acre-feet per year.

- Pit lake water quality: Initial water quality of the pit lake is good, meeting Nevada Drinking Water Standards. Within approximately 190 years, it is predicted that evapoconcentration would result in exeedances of these Standards. Eventually, (over thousands of years) pit water quality would approach that of natural saline lakes and may begin to affect water quality in adjacent aquifers. After 250 years, the TDS of the pit lake is predicted to be 1,056 mg/L.

4.4.3.4 Pipeline Backfill Alternative

Placement of waste rock from the South Pipeline open pit into the Pipeline open pit would result in no significant differences in the impacts to water resources through the end of mining. Although the area of new waste rock piles would be smaller than for the Proposed Action, the resulting impacts would be similar. Significant differences in the long-term pit lake water quality impacts would occur after the end of mining and the filling of the pit lake because the volume and surface area of the pit lake would be less.

4.4.3.4.1 Environmental Consequences and Mitigation Measures

The significance of environmental consequences and mitigation for the Backfill Alternative would be similar to the Proposed Action as described in Section 4.4.3.3, with the exception of the following:

Pit Lake Water Quality

The Pipeline Backfill Alternative would result in a different pit lake water quality because of the increased volume of porous material (primarily calcareous siltstone waste rock) that would be subject to leaching in the pit lake that would result in slightly higher initial concentrations of water quality constituents than the Proposed Action. The difference is illustrated by the year 1 concentrations for the pit lake shown in Table 4.4.14 (TDS of 843 mg/L) compared to Table 4.4.12 for the Proposed Action (year 1 TDS of 787 mg/L). Long-term pit lake water quality will also be different for this option due primarily to the larger ratio of lake surface to volume. At 250 years after mining, this results in an evapoconcentration factor of 2.90 for the Pipeline Backfill Alternative versus 2.13 for the Proposed Action. For the Pipeline Backfill Alternative at 250 years post-closure, antimony (0.0084 mg/L), fluoride (4.66 mg/L), manganese (0.113 mg/L), and TDS (1,199 mg/L) concentrations are predicted to exceed the Nevada water quality standards.

▣ **Impact 4.4.3.4.1-1:** The predicted pit water quality would initially be good. With time, evapoconcentration is predicted to increase constituent concentrations, eventually exceeding enforceable drinking water standards approximately 100 years after the end of mining. As evaporation concentrates pit waters over time, the quality would generally resemble that of natural closed basin lakes in an arid climate. Acidic mine waters are not be predicted to develop. Potential migration of pit waters into the adjacent aquifers would not occur until hydraulic steady-state is reached, beyond 250 years after the end of mining.

Significance of the Impact: As with the Proposed Action, the significance of pit water quality impacts is time dependant. Over the normal timeframe of post-closure monitoring and maintenance (30 years), impacts are less than significant. As discussed under Impact 4.4.3.3.3-2, long-term impacts are considered to be potentially significant and no mitigation measures appear to be feasible.

4.4.3.4.2 Residual Adverse Impacts

Residual adverse impacts of the Pipeline Backfill Alternative would include the following:

- Long-term consumptive water use: Evaporation of water from the post-mining pit lake is estimated to amount to 766 acre-feet per year.
- Pit lake water quality: Initial water quality of the pit lake would be good, meeting Nevada Drinking Water Standards. Within approximately 100 years, it is predicted that evapoconcentration would result in exceedances of these Standards. Eventually, (over thousands of years) pit water quality would approach that of natural saline lakes and may begin to affect water quality in adjacent aquifers. After 250 years, the TDS of the pit lake is predicted to be 1,199 mg/L.

4.4.3.5 No Action Alternative

The No Action Alternative consists of dewatering and mining of the Pipeline open pit. The peak rate of pumping for dewatering the mine is the same as for the Proposed Action, although the consumptive use of the No Action Alternative is 2,000 gpm less and the duration of pumping is seven years rather than 13 years. In addition, the delivery of 6,000 gpm (annualized) to the Dean Ranch would not occur. The size of waste piles, tailings, and heap leach facilities are less for the No Action Alternative, but the impacts on water resources are considered to be the same as the Proposed Action because applicant-committed measures and design would render the potential impacts less than significant. The post-mining pit lake would be smaller, with a lower rate of evaporation and a different evolution of water quality.

The following sections describe the differences in the significance of environmental consequences and mitigation between the No-Action Alternative and the Proposed Action.

Table 4.4.14: Model-Predicted Solute Concentration at Selected Years for the Backfill Alternative

	Years After End of Mining						
Analyte	**1**	**5**	**10**	**50**	**100**	**200**	**250**
Calcite	0.000	5.731	9.059	21.281	29.947	43.032	48.793
Ferrihydrite	0.198	0.447	0.608	0.932	1.087	1.286	1.362
Barite	0.213	0.436	0.551	0.751	0.840	0.902	0.921
Gibbsite(C)	0	0	0	0	0	0	0
pH	7.620	8.153	8.163	8.204	8.211	8.225	8.235
TDS	843	806	804	892	984	**1128**	**1199**
Alkalinity	301	265	263	261	268	280	288
Aluminum	0.012	0.012	0.013	0.015	0.017	0.019	0.021
Antimony	0.0043	0.0046	0.0048	0.0060	**0.0067**	**0.0078**	**0.0084**
Arsenic	0.018	0.019	0.019	0.023	0.027	0.032	0.034
Barium	0.010	0.009	0.009	0.008	0.007	0.007	0.006
Beryllium	1.68E-06	2.82E-07	2.56E-07	2.31E-07	3.35E-07	3.52E-07	3.31E-07
Cadmium	0.0007	0.0007	0.0007	0.0010	0.0011	0.0013	0.0014
Calcium	82	71	70	67	67	65	63
Chlorine	90	88	88	108	125	151	164
Chromium	0.0071	0.0065	0.0064	0.0076	0.0082	0.0093	0.0098
Copper	0.0032	0.0033	0.0034	0.0040	0.0045	0.0051	0.0054
Fluorine	2.61	2.64	2.64	3.10	3.54	**4.28**	**4.66**
Iron	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004
Lead	0.0013	0.0015	0.0015	0.0018	0.0020	0.0022	0.0023
Magnesium	29	30	30	37	42	52	56
Manganese	0.072	0.071	0.072	0.085	0.094	**0.107**	**0.113**
Mercury	3.86E-05	3.87E-05	3.91E-05	4.87E-05	5.51E-05	6.34E-05	6.69E-05
Molybdenum	0.015	0.015	0.017	0.021	0.024	0.029	0.032
Nickel	0.009	0.008	0.008	0.010	0.011	0.012	0.013
Nitrate	1.193	1.219	1.216	1.422	1.629	1.937	2.077
Potassium	15	15	16	19	22	26	29
Selenium	0.0014	0.0016	0.0018	0.0025	0.0028	0.0034	0.0037
Silver	0.0010	0.0012	0.0015	0.0022	0.0025	0.0029	0.0032
Sodium	116	117	117	140	160	194	211
Sulfate	206	214	215	257	295	354	383
Thallium	0.0006	0.0007	0.0007	0.0008	0.0009	0.0011	0.0012
Vanadium	0.0013	0.0009	0.0007	0.0007	0.0009	0.0011	0.0012
Zinc	0.049	0.049	0.051	0.064	0.068	0.061	0.060
Evapoconcentration Factor	1.02	1.09	1.14	1.44	1.85	2.50	2.90

Concentrations in mg/L; pH in standard units; solid phase precipitate values are cumulative.
Use of one-half detection limits as a proxy for solutes not detected in ground water or leaching tests resulted in predicted concentrations for Ag, Al, Be, Cd, Cr, Ni, Pb, Se, Tl, and V that may be higher than actually occurs.
Exceedances of enforceable drinking water standards are shown in bold-face type.

4.4.3.5.1 Environmental Consequences and Mitigation Measures

Effects of Drawdown on Streams and Springs

The pit dewatering system is expected to lower (drawdown) the ground water table in an area surrounding the open pit. The drawdown of the water table could potentially affect surface water flow in certain streams and springs. Ground water modeling results indicate that the ground water level would not be drawn down by 10 feet or more at any of the perennial streams or springs at the end of mining, after seven years of mine dewatering as shown on Figure 4.4.20. Water table drawdown contours at 20 years after the end of mining are shown on Figure 4.4.21. Impacts to Chillis Hot Spring, on the Crescent Valley side of Rocky Pass are possible because the predicted 10-foot drawdown contour extends to this area 20 years after mining. Since the sources of flow to this spring are not believed to be hydraulically connected to the basin-fill aquifer the impact to this spring is considered to be potentially significant.

The remainder of inventoried springs in Crescent Valley are located farther from the area of drawdown induced by the No Action Alternative than those described above and are not expected to be significantly impacted by mine dewatering.

▣ **Impact 4.4.3.5.1-1:** Mine dewatering is not expected to affect flows in streams. The predicted drawdown at inventoried springs is predicted to be more than 10 feet at one spring near Rocky Pass at 20 years after the end of mining.

Significance of the Impact: Potentially significant impacts at one spring are predicted by more than 10 feet of drawdown of the valley-fill aquifer in the ground water model. Although significant impacts are not predicted to occur in the other individual streams, springs or spring groups, the uncertainty of predicting impacts to springs indicates a need for operational monitoring and contingent mitigation measures to be implemented if significant impacts occur. Impacts are considered less than significant after implementation of mitigation measures as described in the Pipeline project FEIS Section 4.4.5-1 (BLM 1996a) only if the impacts are detected and mitigated prior to the end of mining. Since the significant impact to the affected spring is not predicted to occur until after the end of mining, additional mitigation such as the Proposed Action Mitigation Measure 4.4.3.3.1-2b is needed to address this significant impact.

Evaporative Losses

Evaporative losses would occur during mine operations from the surfaces of the infiltration ponds at a rate similar to that of the Proposed Action and are not considered to be a significant impact.

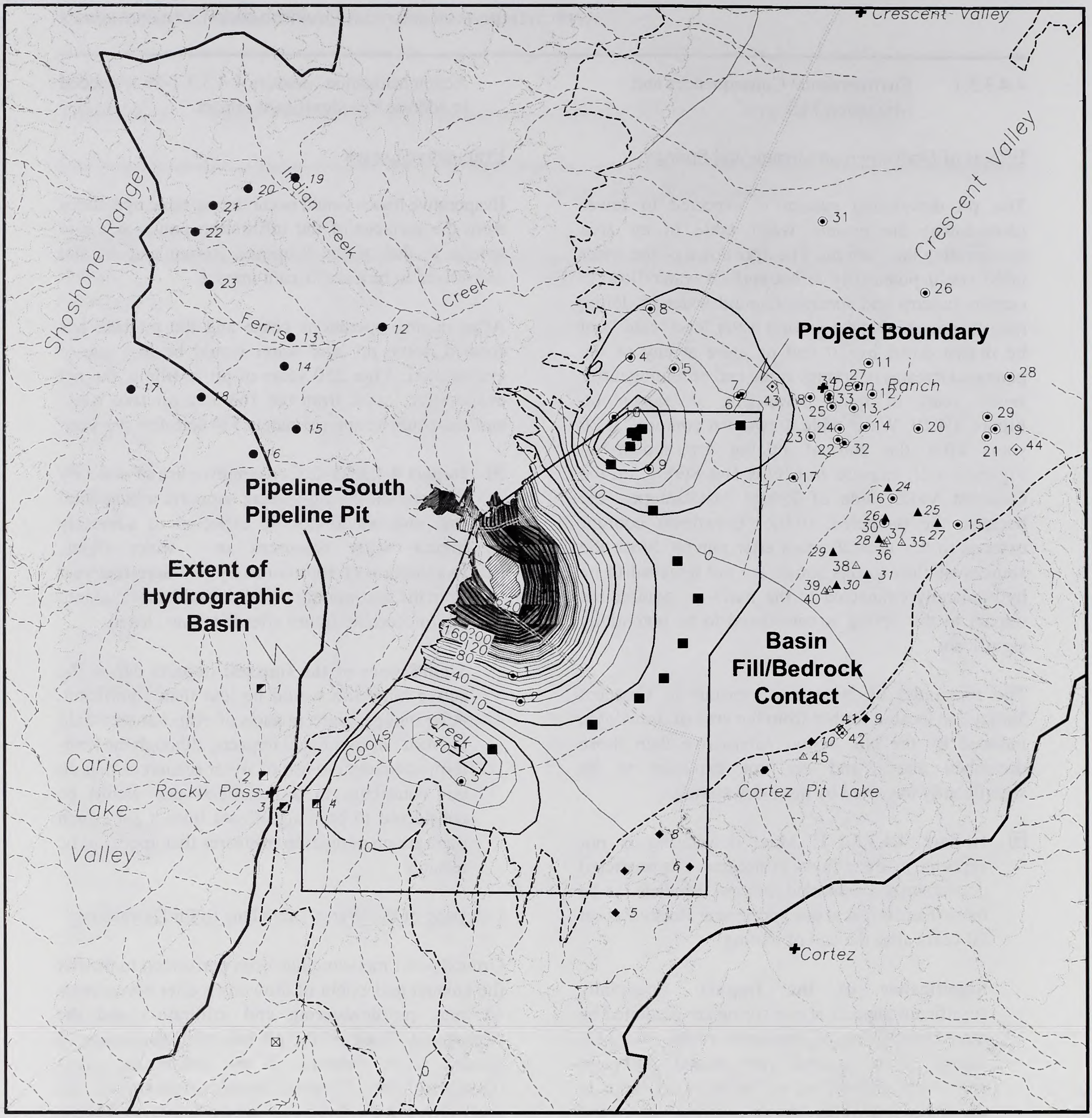
After mining operations cease and the pit lake has formed, some pit lake water would be lost due to evaporation. After 250 years of pit re-filling, the net evaporative losses from the 163-acre pit lake water surface would be approximately 534 acre-feet per year.

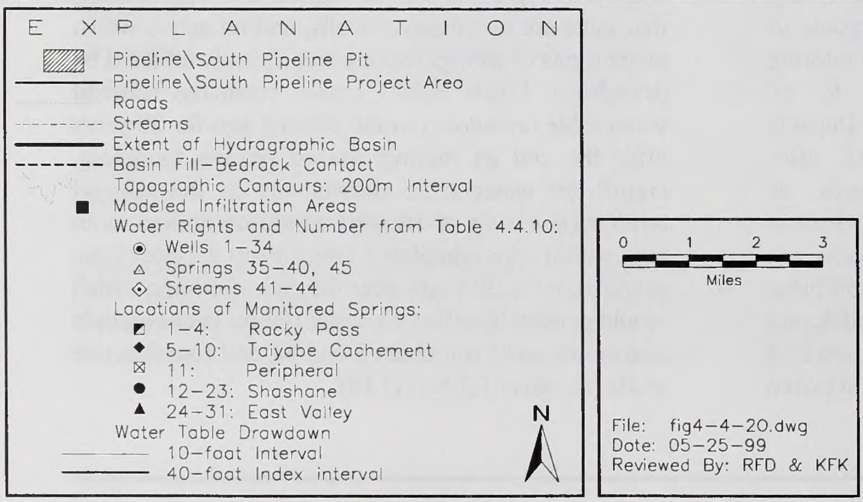
▣ **Impact 4.4.3.5.1-2:** Consumptive use of water by evaporation during mining supports a beneficial use, and would not be expected to adversely impact water resources or water rights. Evaporation of approximately 534 acre-feet/year from the post-mining pit lake would continue into the foreseeable future after the mine closed.

Significance of the Impact: Impacts during the active mine life would be less than significant. After mining, direct impacts of evaporation would not result in significant impacts, although the long-term consumptive use of water resources that do not contribute to a beneficial use would be considered to be a significant impact for which there are no mitigation measures that appear to be feasible.

Lowering of the Water Table Due to Pit Dewatering

Ground water modeling has been performed to predict the amount and extent of drawdown after seven years of mine pit dewatering and infiltration and the subsequent filling of the pit lake and dissipation of ground water mounds at the infiltration areas (Geomega 1998a). Modeled drawdown contours at the end of mining are shown on Figure 4.4.20, indicating that there are two inactive wells, and no active wells, water rights or springs that are significantly affected by drawdown. Figure 4.4.21 shows predicted residual water table drawdown in the alluvial aquifer 20 years after the end of mining. Based on the modeling, significant water table drawdowns in the alluvial aquifer (in excess of 10 feet) would be limited to an area within approximately 6 miles from the site of the proposed pit at 20 years after the end of mining which would potentially affect six water rights. These include two active wells (numbers 3 and 4), and four inactive wells (numbers 1,2,9, and 10).

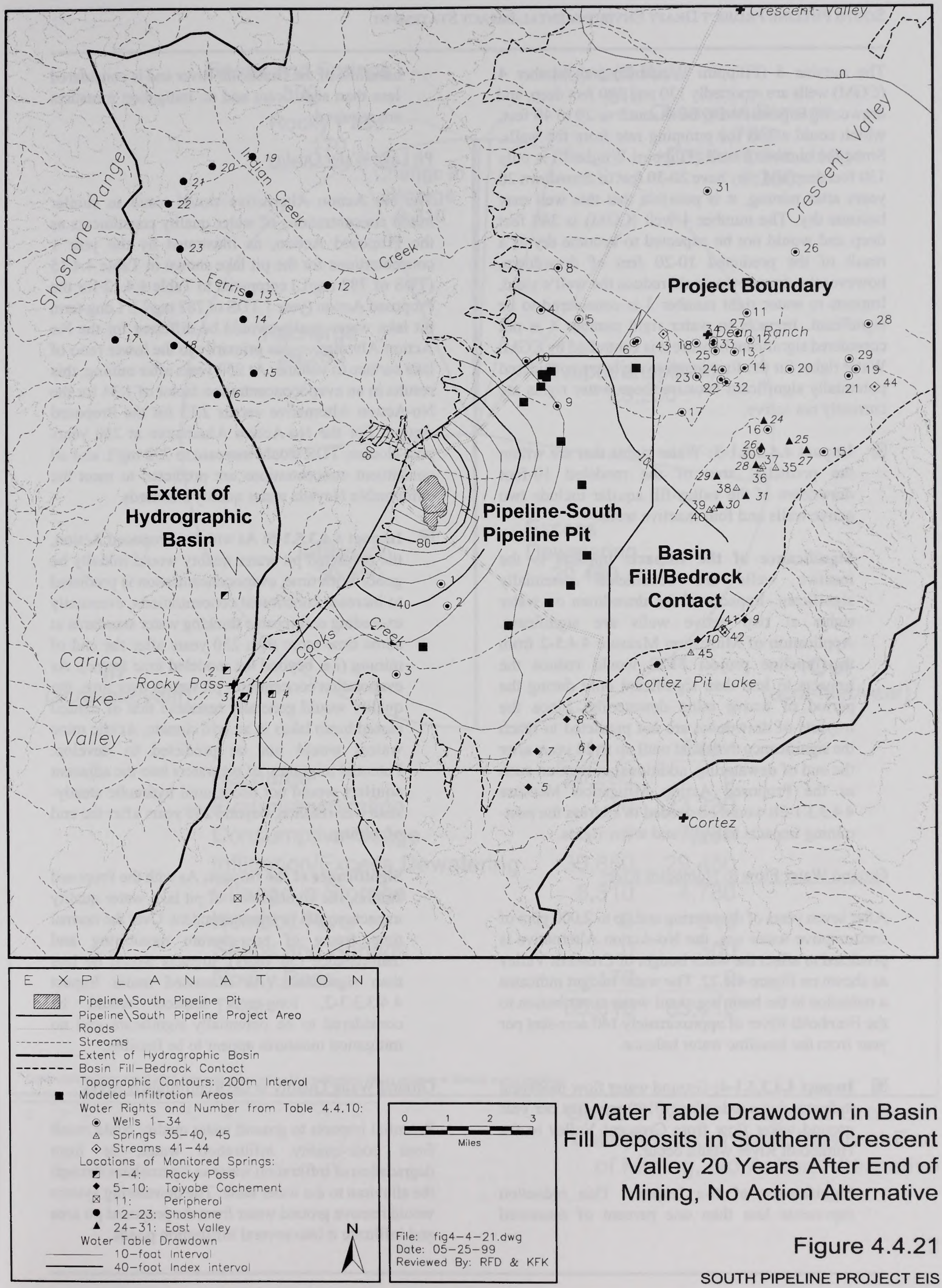




Water Table Drawdown in Basin Fill Deposits in Southern Crescent Valley at End of Mining, No Action Alternative

Figure 4.4.20

SOUTH PIPELINE PROJECT EIS



Water Table Drawdown in Basin Fill Deposits in Southern Crescent Valley 20 Years After End of Mining, No Action Alternative

Figure 4.4.21

SOUTH PIPELINE PROJECT EIS

The number 3 (Filippini Windmill) and number 4 (CGM) wells are reportedly 130 and 340 feet deep, and drawdown is predicted to be as much as 20 to 40 feet, which could affect the pumping rate from the wells. Since the number 3 well (Filippini Windmill) is only 130 feet deep and may have 20-30 feet of drawdown 20 years after mining, it is possible that this well may become dry. The number 4 well (CGM) is 340 feet deep and would not be expected to become dry as a result of the predicted 10-20 feet of drawdown, however the drawdown could reduce the well's yield. Impacts to water right number 3 is considered to be significant. Impacts to water right number 4 is not considered significant because it is controlled by CGM. Water rights for the four inactive wells are considered potentially significant because these water rights are currently not active.

- **Impact 4.4.3.5.1-3:** Water rights that are within the predicted area of the modeled 10-foot drawdown of the valley-fill aquifer include two active wells and four inactive wells.

  Significance of the Impact: Impacts to the inactive wells are considered potentially significant. Impacts of the drawdown on water rights at two active wells are significant. Application of Mitigation Measure 4.4.5-2 from the Pipeline project FEIS would reduce the impacts to less than significant only during the period of active mine dewatering. Since the impacts of drawdown are not predicted to reach the significance threshold until up to 20 years after the end of dewatering, additional mitigation such as the Proposed Action Mitigation Measure 4.4.3.3.1-2b would be needed to address the post-mining impacts to wells and water rights.

Ground Water Flow to Humboldt River

After seven years of dewatering and up to 2,000 gpm of consumptive water use, the No-Action Alternative is predicted to affect the water budget of Crescent Valley as shown on Figure 4.4.22. The water budget indicates a reduction in the basin's ground water contribution to the Humboldt River of approximately 140 acre-feet per year from the baseline water balance.

- **Impact 4.4.3.5.1-4:** Ground water flow modeling indicates that a reduction of 140 acre-feet per year ground water flow from Crescent Valley to the Humboldt River would occur.

  Significance of the Impact: This reduction represents less than one percent of measured baseflow of the Humboldt River and is considered less than significant and no mitigation measures are required.

Pit Lake Water Quality

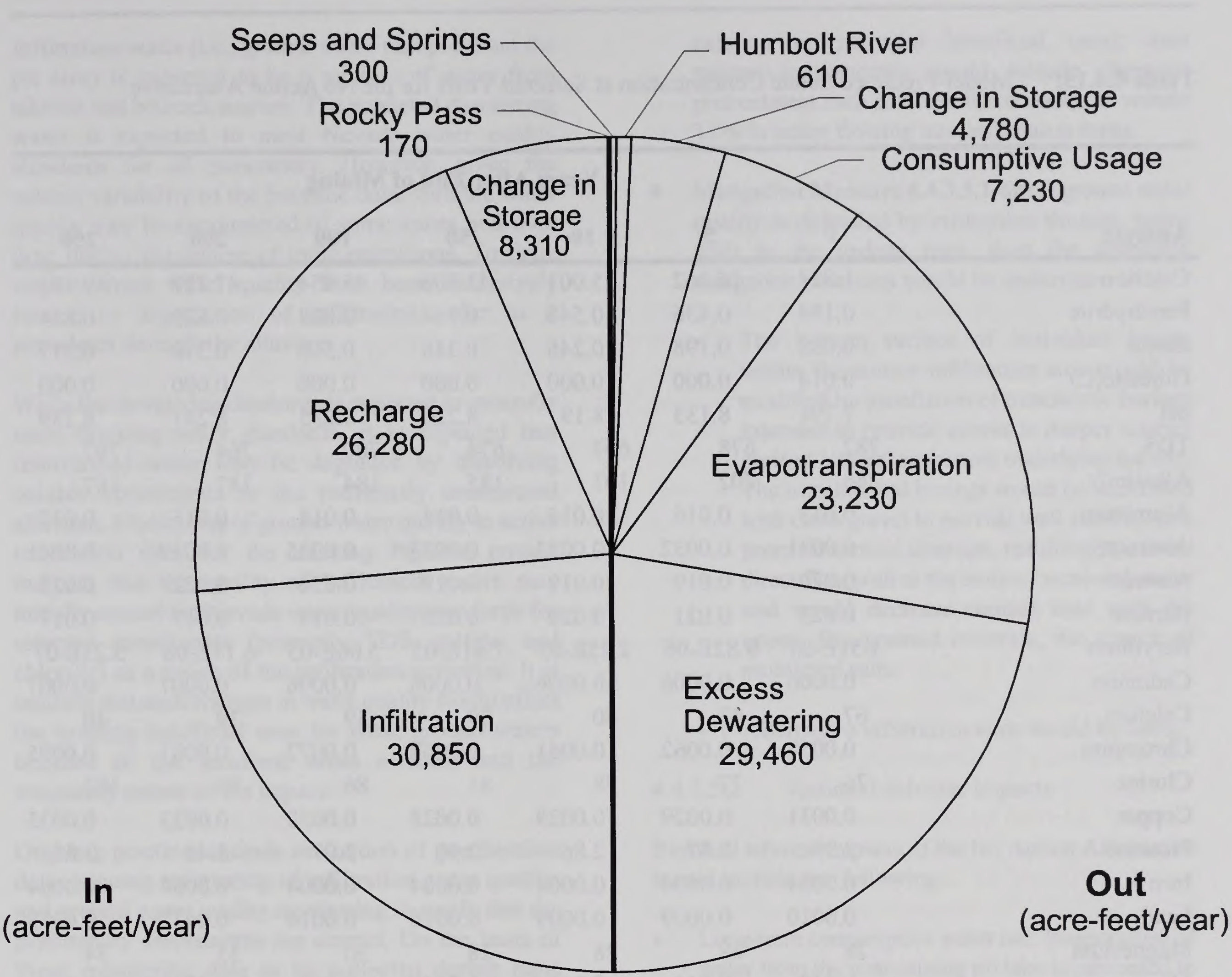
The No Action Alternative would result in similar initial concentrations of water quality constituents as the Proposed Action, as illustrated by the year 1 concentrations for the pit lake shown in Table 4.4.15 (TDS of 782 mg/L) compared to Table 4.4.12 for the Proposed Action (year 1 TDS of 787 mg/L). Long-term pit lake water quality would be different for the No Action Alternative due primarily to the lower ratio of lake surface to volume. At 250 years after mining, this results in an evapoconcentration factor of 1.34 for the No-Action Alternative versus 2.13 for the Proposed Action. For the No-Action Alternative at 250 years post-closure, TDS would increase to 792 mg/L and all constituent concentrations are predicted to meet the enforceable Nevada water quality standards.

- **Impact 4.4.3.5.1-5:** As with the Proposed Action, the predicted pit water quality would initially be good. With time, evapoconcentration is predicted to increase constituent concentrations, eventually exceeding enforceable drinking water standards at some time more than 250 years after the end of mining (i.e. beyond the modeled time frame). As evaporation concentrates pit waters over time, the quality would generally resemble that of natural closed basin lakes in an arid climate. Acidic mine waters would not be predicted to develop. Potential migration of pit waters into the adjacent aquifers would not occur until hydraulic steady-state was reached, beyond 250 years after the end of mining.

  Significance of the Impact: As with the Proposed Action, the significance of pit lake water quality impacts would be time dependant. Over the normal time frame of post-closure monitoring and maintenance (30 years), impacts would be less than significant. As discussed under Impact 4.4.3.3.3-2, long-term impacts would be considered to be potentially significant and no mitigation measures appear to be feasible.

Ground Water Quality in the Reinfiltration Areas

Potential impacts to ground water quality could result from poor-quality infiltration water, or from degradation of infiltration water as it percolates through the alluvium to the water table. The dewatering system would remove ground water from the proposed pit area and infiltrate it into several infiltration ponds.



	In	Out
Recharge	26,280	0
Evapotranspiration[1]	0	23,230
Consumptive Usage	0	7,230
Infiltration/Excess Dewatering	30,850	29,460
Change in Storage	8,310	4,780
Humbolt River	0	610
Seeps and Springs	0	300
Rocky Pass	170	0
Total	65,610	65,610

[1] Computed evapotranspiration rate was adjusted by approximately 3% to achieve a closing water balance.

E X P L A N A T I O N

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Reviewed By: RFD & KFK

Ground Water Budget of Crescent Valley Hydrographic Basin at End of Mining, No Action Alternative

Figure 4.4.22

Table 4.4.15: Model-Predicted Solute Concentration at Selected Years for the No Action Alternative

	Years After End of Mining						
Analyte	**1**	**5**	**10**	**50**	**100**	**200**	**250**
Calcite	1.824	16.862	25.001	42.806	45.054	47.757	49.107
Ferrihydrite	0.184	0.436	0.548	0.784	0.808	0.829	0.844
Barite	0.088	0.198	0.246	0.348	0.360	0.370	0.377
Gibbsite(C)	0.014	0.000	0.000	0.000	0.000	0.000	0.000
pH	7.794	8.133	8.19	8.226	8.235	8.241	8.239
TDS	782	678	667	674	700	764	792
Alkalinity	286	202	191	185	184	187	187
Aluminum	0.013	0.016	0.015	0.014	0.015	0.016	0.017
Antimony	0.0031	0.0032	0.0032	0.0033	0.0035	0.0039	0.0041
Arsenic	0.020	0.019	0.019	0.019	0.020	0.022	0.023
Barium	0.023	0.021	0.020	0.020	0.019	0.017	0.017
Beryllium	1.51E-06	9.82E-06	2.25E-05	7.61E-05	5.06E-05	6.17E-06	5.23E-07
Cadmium	0.0006	0.0006	0.0006	0.0006	0.0006	0.0007	0.0007
Calcium	67	43	40	39	39	39	40
Chromium	0.0058	0.0062	0.0061	0.0063	0.0072	0.0087	0.0095
Clorine	76	77	78	81	86	96	102
Copper	0.0031	0.0029	0.0029	0.0028	0.0030	0.0033	0.0035
Flourine	2.99	2.87	2.86	2.90	3.07	3.46	3.65
Iron	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004
Lead	0.0010	0.0009	0.0009	0.0010	0.0010	0.0012	0.0013
Magnesium	28	28	28	28	30	33	34
Manganese	0.049	0.045	0.045	0.046	0.048	0.053	0.056
Mercury	3.18E-05	2.28E-05	2.28E-05	2.56E-05	2.71E-05	2.91E-05	3.01E-05
Molybdenum	0.014	0.013	0.013	0.013	0.014	0.016	0.017
Nickel	0.008	0.008	0.008	0.008	0.009	0.011	0.012
Nitrate	1.251	1.249	1.248	1.262	1.330	1.478	1.548
Potassium	16	16	16	16	17	19	20
Selenium	0.0010	0.0009	0.0009	0.0009	0.0010	0.0012	0.0013
Silver	0.0006	0.0005	0.0005	0.0005	0.0006	0.0007	0.0008
Sodium	115	114	114	117	124	139	146
Sulfate	190	195	197	204	217	246	260
Thallium	0.0009	0.0008	0.0008	0.0008	0.0008	0.0009	0.0009
Vanadium	0.0009	0.0009	0.0009	0.0009	0.0009	0.0009	0.0010
Zinc	0.014	0.010	0.009	0.009	0.010	0.010	0.010
Evapoconcentration Factor	1.02	1.04	1.05	1.09	1.15	1.27	1.34

Concentrations in mg/L; pH in standard units; solid phase precipitate values are cumulative.
Use of one-half detection limits as a proxy for solutes not detected in ground water or leaching tests resulted in predicted concentrations for Ag, Al, Be, Cd, Cr, Ni, Pb, Se, Tl, and V that may be higher than actually occurs.
Exceedances of enforceable drinking water standards are shown in bold-face type.

Infiltration water (i.e., ground water pumped from the pit area) is expected to be a mixture of water from alluvial and bedrock sources. The predicted dewatering water is expected to meet Nevada water quality standards for all parameters. However, given the natural variability of the baseline data, variable water quality may be encountered in some zones and over time during the course of mine operations. To date, impacts from water quality have been exclusively related to degradation of infiltration water as it percolates through the alluvium.

While the dewatering discharge is expected to generally meet drinking water standards, it is expected that reinfiltrated water may be degraded by dissolving soluble constituents in the previously unsaturated alluvium. Monitoring of ground water quality at active infiltration sites for the existing Pipeline project indicate that the quality of infiltrated waters may initially exceed the Nevada water quality standards for selected constituents (primarily TDS, sulfate, and chloride) as a result of the infiltration activities. It is unlikely that such changes in water quality would affect the existing beneficial uses for these ground waters because of the localized areas affected and the temporary nature of the impact.

Ongoing practices include evaluation of geochemical data, ongoing monitoring of infiltration water quality, and ground water quality monitoring to verify that the preliminary assessments are correct. On the basis of these monitoring data to be collected during mine operation, impacts to water quality due to infiltration of water pumped from the pit would be evaluated. There would be a potential for impacts to ground water quality in the infiltration areas due to dissolution of evaporite minerals as water passes through the alluvium to the aquifer.

▣ **Impact 4.4.3.5.1-6:** It is possible that infiltrated water may temporarily exceed the Nevada water quality standards for selected constituents as a result of either poor quality of pumped ground water or dissolution of saline soils beneath the infiltration ponds.

Significance of the Impact: This impact is considered potentially significant. The following mitigation measures would reduce the impact to less than the level of significance.

- **Mitigation Measure 4.4.3.5.1-6a:** In the event monitoring shows that reinfiltration water is of sufficiently poor quality to degrade ground water beneath the infiltration ponds (e.g., raise TDS levels to greater than applicable standards for existing or potential beneficial uses), then mitigation measures would include chemical pretreatment such as flocculation basins to reduce TDS in water flowing into infiltration areas.

- **Mitigation Measure 4.4.3.5.1-6b:** If ground water quality is degraded by infiltration through saline soils in the vadose zone, then the following mitigation measures would be undertaken:

  - The bottom surface of individual basins within the source infiltration area would be modified by installation of trenches or borings intended to provide access to deeper coarse-grained alluvial sequences underlying the site. The trenches and borings would be backfilled with clean gravel to provide wall stability and promote vertical drainage, resulting in a more direct flow path to the body of receiving water and would decrease contact time with the upper, fine-grained minerals, the source of mobilized salts.

  - Alternative infiltration sites would be used.

4.4.3.5.2 Residual Adverse Impacts

Residual adverse impacts of the No Action Alternative would include the following:

- Long-term consumptive water use: Evaporation of water from the post-mining pit lake is estimated to amount to 534 acre-feet per year.

- Pit lake water quality: Initial water quality of the pit lake is good, meeting Nevada Drinking Water Standards. It is predicted that after 250 years, the pit water quality would still be within the enforceable Nevada Drinking Water Standards, with a TDS predicted to be 792 mg/L. At some extended time of more than 250 years, it is expected that evapoconcentration would result in exeedances of these Standards. Eventually, (over thousands of years) pit water quality would approach that of natural saline lakes and may begin to affect water quality in adjacent aquifers.

4.5 Air Resources

4.5.1 Regulatory Framework

Ambient air quality and the emission of air pollutants are regulated under both federal and state laws and regulations. Regulations potentially applicable to the Proposed Action include the following: National Ambient Air Quality Standards (NAAQS); State

Ambient Air Quality Standards (SAAQS); Prevention of Significant Deterioration (PSD); New Source Performance Standards (NSPS); Federal Operating Permit Program (Title V); and State of Nevada standards for permits to operate.

4.5.1.1 Federal Clean Air Act

The Federal Clean Air Act (CAA), and the subsequent Clean Air Act Amendments of 1990 (CAAA), require the Environmental Protection Agency (EPA) to identify NAAQS to protect public health and welfare. The CAA and the CAAA established NAAQS for six pollutants, known as "criteria" pollutants because the ambient standards set for these pollutants satisfy "criteria" specified in the CAA. A list of the criteria pollutants regulated by the CAA, and their currently applicable NAQQS set by the EPA for each, are listed in Table 4.5.1. The list of criteria pollutants was amended by the EPA on July 18, 1997 and now includes two new standards for particulate matter of aerodynamic diameter less than 2.5 micrometers ($PM_{2.5}$), and revised standards for PM_{10} and O_3 (see 62 *Federal Register* 38652-38760 [$PM_{2.5}$ and PM_{10}]; 62 *Federal Register* 38856-38896 [O_3]). The new $PM_{2.5}$ standards are set at 15 $\mu g/m^3$, 3-year annual arithmetic mean, and a 65 $\mu g/m^3$, 24-Hour average standard based on the 98th percentile, averaged over three years. In addition, EPA will be modifying the current 24-hour PM_{10} standard from a one "allowed" exceedance per year to a standard based on the 99th percentile of the monitored data, averaged over three years. The current 1-hour O_3 standard is being replaced with a new 8-hour O_3 standard of 0.08 ppm. The revised O_3 standard will become effective once an area meets the current 1-hour standard, and is meant to protect against longer exposures to O_3. An EPA-accepted monitoring network for $PM_{2.5}$ does not exist, and it is expected to take until the year 2003 before sufficient ambient $PM_{2.5}$ measurements can be obtained to allow the EPA to establish attainment status designations. Depending upon the status of compliance with the current NAAQS for PM_{10} and the pace with which ambient $PM_{2.5}$ concentrations are established and compliance plans developed and adopted, states may have up to the year 2017 to meet these new $PM_{2.5}$ standards. As such, and since there is a lack of sufficient data to develop a comprehensive emissions inventory, the $PM_{2.5}$ standard will not be addressed in this document.

4.5.1.2 Attainment and Non-Attainment Area

Pursuant to the CAA, the EPA has developed classifications for distinct geographic regions known as air basins. Under these classifications, for each federal criteria pollutant, each air basin (or portion of an air basin ["planning area"]) is classified as in "attainment," if the air basin (or planning area) has "attained" compliance with (that is, not exceeded) the adopted NAAQS for that pollutant, or is classified as "non-attainment" if the levels of ambient air pollution exceed the NAAQS for that pollutant. Air basins for which sufficient ambient monitoring data is not available are designated as "unclassified" for those particular pollutants.

In addition to the designations relative to attainment of conformance with the NAAQSs, the CAA requires the EPA to place each airshed within the United States into one of three classes, which are designed to limit the deterioration of air quality when it is "better than" the NAAQSs. Class I is the most restrictive air quality category, and was created by Congress to prevent further deterioration of air quality in National Parks and Wilderness Areas of a given size which were in existence prior to 1977, or those additional areas which have since been designated Class I under federal regulations (40 CFR 52.21). All remaining areas outside of the designated Class I boundaries were designated Class II airsheds, which allow a relatively greater deterioration of air quality over that in existence in 1977, although still below NAAQSs. No Class III areas, which would allow air quality to degrade to the NAAQSs, have been designated. The nearest Class I airshed to the Project, the Jarbidge Wilderness Area, is located approximately 118 miles northeast of the Project Area (BLM 1996a). There are no Class I airsheds within 60 miles of the Project Area.

4.5.1.3 Prevention of Significant Deterioration

Federal Prevention of Significant Deterioration (PSD) regulations limit the maximum allowable increase in ambient particulate matter in a Class I airshed resulting from a major stationary source to 5 $\mu g/m^3$ (annual geometric mean) and 10 $\mu g/m^3$ (24-hour average). Increases in other criteria pollutants are similarly limited. Specific types of facilities which emit, or have the potential to emit, 100 tons per year or more of PM_{10} or other criteria air pollutants, or any facility which emits, or has the potential to emit, 250 tons per year or more of PM_{10} or other criteria air pollutants, is considered a major stationary source. However, most fugitive emissions are not counted as part of the calculation of emissions for PSD.

4.5.1.4 New Source Performance Standards

NSPSs were established by the CAA. The standards, which are for new or modified stationary sources, require the sources to achieve the best demonstrated emissions control technology. The NSPS apply to

Table 4.5.1: Federal and State Ambient Air Quality Standards for Criteria Pollutants

Criteria Pollutant	Averaging Period	Nevada Standards	Federal Standards	
		Concentration[a]	Primary[a]	Secondary[a]
Ozone (O_3)	1-Hour	120 ppbv (235 $\mu g/m^3$)	120 ppbv (235 $\mu g/m^3$)	Same as Primary Standards
	8-Hour[c]	---	80 ppbv (157 $\mu g/m^3$)	
Carbon Monoxide (CO)	8-Hour (<5,000')[b]	9 ppmv (10 mg/m^3)	9 ppmv (10 mg/m^3)	---
	8-Hour (≥5,000')[b]	6 ppmv (6.67 mg/m^3)	9 ppmv (10 mg/m^3)	
	1-Hour[b]	35 ppmv (23 mg/m^3)	35 ppmv (40 mg/m^3)	
Oxides of Nitrogen (NO_x) as Nitrogen Dioxide (NO_2)	Annual	100 $\mu g/m^3$ (53 ppbv)	100 $\mu g/m^3$ (53 ppbv)	Same as Primary Standards
Sulfur Dioxide (SO_2)	Annual	80 $\mu g/m^3$ (30 ppbv)	80 $\mu g/m^3$ (30 ppbv)	---
	24-Hour[b]	365 $\mu g/m^3$ (140 ppbv)	365 $\mu g/m^3$ (140 ppbv)	---
	3-Hour[b]	1,300 $\mu g/m^3$ (500 ppbv)	---	1,300 $\mu g/m^3$ (500 ppbv)
Particulate Matter ≤ 10 Microns in Aerodynamic Diameter (PM_{10})	24-Hour[b]	150 $\mu g/m^3$	150 $\mu g/m^3$	
	24-Hour (Based on the 99th Percentile Averaged over Three Years)	---	150 $\mu g/m^3$	Same as Primary Standards
	Annual Arithmetic Mean	50 $\mu g/m^3$	50 $\mu g/m^3$	
Particulate Matter ≤ 2.5 Microns in Aerodynamic Diameter ($PM_{2.5}$)	24-Hour (Based on the 98th Percentile Averaged over Three Years)	---	65 $\mu g/m^3$	
	Annual Arithmetic Mean Averaged Over Three Years	---	15 $\mu g/m^3$	
Lead (Pb)	Calendar Quarter	1.5 $\mu g/m^3$	1.5 $\mu g/m^3$	Same as Primary Standards

a Equivalent units given in parentheses are based upon a reference temperature of 25°C and a reference pressure of 760 mm mercury. Measurements of air quality are corrected to a reference temperature of 25°C and a reference pressure of 760 mm mercury (1,013.2 millibar); ppmv and ppbv in this table refer to parts per million by volume and parts per billion by volume, respectively, or micro-moles of pollutant per mole of gas. $\mu g/m^3$ ≡ micrograms per cubic meter.

b A violation occurs on the second exceedance during a calendar year.

c The 8-Hour ozone standard will be implemented once an area achieves attainment for the 1-Hour ozone standard.

specific types of processes, which in the case of the Proposed Action include certain units used to process metallic minerals. The requirements applicable to these existing units are found in 40 CFR Part 60, Subpart LL (Standards of Performance for Metallic Mineral Processing Plants).

4.5.1.5 Federal Operating Permit Program

As part of the CAA and its subsequent amendments, a facility-wide permitting program was established for larger sources of pollution. This program, known as the Federal Operating Permit, or Title V, program, requires that these "major sources" of air pollutants submit a Title V permit application. To be classified as a "major source", a facility must emit more than 100 tons per year (tpy) of any regulated pollutant, 10 tpy of any single hazardous air pollutant (HAP), or 25 tpy or more of any combination of HAPs, from applicable sources.

4.5.1.6 Nevada Bureau of Air Quality

The CAA delegates primary responsibility for air pollution control to state governments, which in turn often delegates this responsibility to local or regional organizations. The State Implementation Plan (SIP) was originally the mechanism by which a state set emission limits and allocated pollution control responsibility to meet the NAAQS. The function of a SIP broadened after passage of the 1990 Clean Air Act Amendments, and now includes the implementation of specific technology-based emission standards, permitting of sources, collection of fees, coordination of air quality planning, and prevention of significant deterioration of air quality within regional planning areas and statewide. Section 176 of the CAA, as amended, requires that federal agencies must not engage in, approve, or support in any way any action that does not conform to a SIP for the purpose of attaining ambient air quality standards (Wooley 1997).

The Bureau of Air Quality (BAQ) is the agency in the State of Nevada which has been delegated the responsibility for implementing a SIP (excluding Washoe and Clark Counties which have their own SIP). Included in a SIP are the State of Nevada air quality permit programs (NAC 445B.001 through 445B.395, inclusive). Also part of a SIP is the SAAQS. The SAAQS are generally identical to the NAAQS with the exception of the following: (a) an additional standard for carbon monoxide (CO) in areas with an elevation in excess of 5,000 feet above sea level; (b) the recently promulgated (July 18, 1997) NAAQS for particulate matter of aerodynamic diameter less than 2.5 microns ($PM_{2.5}$); (c) the revised NAAQS for particulate matter of aerodynamic diameter less than 10 microns (PM_{10}); and (d) ozone (O_3) (Nevada has yet to adopt the new and revised standards). In addition to establishing the SAAQS, the BAQ is responsible for permit and enforcement activities throughout the State of Nevada.

The Proposed Action is located in Lander County, Nevada. The permitting authority for the county is the BAQ. Before any construction of a potential source of air pollution can occur, an air quality permit application must be submitted to the BAQ in order to obtain an Air Quality Operating Permit.

4.5.2 Affected Environment

4.5.2.1 Study Methods

The existing meteorological and air quality conditions in the air quality study area were obtained from the source documents listed in the following sections. Baseline air quality and meteorological conditions representative of the Project Area were assessed using data from the Pipeline project and other nearby monitoring stations in northern Nevada. Meteorological and air quality data are currently being collected at the Pipeline project. The Cortez Monitoring Station measures ambient temperature, wind speed, and wind direction at 33 feet above ground surface, as well as PM_{10} concentrations.

The Project Area is located in the Crescent Valley Air Basin (CVAB), which includes the area bounded by the crest of the Shoshone Range and the Tuscarora Mountains to the north and west and the crest of the Toiyabe and Cortez Mountains to the south and east. The CVAB has the same boundary as the Crescent Valley Hydrographic Basin, which is shown on Figure 4.4.1.

4.5.2.2 Existing Conditions

The Pipeline project currently operates under a valid air quality permit, AP1041-0619, issued by the BAQ. The Pipeline project is not included in any of the source categories listed in the Federal PSD Regulations, and the PSD applicable emissions from the Pipeline project are below the 250 tpy PSD threshold. Therefore the Pipeline project is not subject the PSD regulation. The Pipeline project currently operates specific mineral processing equipment which are subject to NSPS. The requirements under the NSPS are addressed in the current air quality operating permit, AP1041-0619. The Pipeline project is not "major source" of air pollutants in the Title V program, and, therefore, is not required to submit a Title V application or obtain a Title V permit.

4.5.2.2.1 Climate and Meteorology

The Project Area is a high-desert environment characterized by arid-to-semiarid conditions, with bright sunshine, low annual precipitation, and large daily ranges in temperatures. The climate is controlled primarily by the rugged and varied topography to the west, in particular, the Sierra Nevada Range. Prevailing westerly winds move warm, moist Pacific air over the western slopes of the Sierra Nevada Range where the air cools, condensation takes place, and most of the moisture falls as precipitation. As the air descends the eastern slope, compressional warming takes place resulting in minimal rainfall. Annual precipitation is estimated to be less than 8 inches per year (BLM 1996a; page 3-4) in the Project Area.

Due to the high elevation and proximity of the mountains, there is a wide temperature range, with cool nights predominating even in the summer months. Data from the Elko meteorological monitoring station located at Elko Municipal Airport (Elko Station) indicate that the annual temperature averaged 46 degrees Fahrenheit (°F) (BLM 1996a; page 3-4). At the Cortez Station, meteorological monitoring data for calendar year 1997 show that the average temperature was 53 °F, with temperatures ranging from 98 °F in August to -1 °F in January (Gelhaus 1997a; 1997b; 1997c; 1998).

Atmospheric dispersion is influenced by several parameters, including wind speed, temperature inversions (mixing heights), and atmospheric stability. Prevailing winds at the Cortez Station, based on the 1997 meteorological data, were from the east with average annual wind speeds at 7 miles per hour (mph). Month to month variations were minimal with speeds ranging from 6-9 mph. (Gelhaus 1997a; 1997b; 1997c; 1998). These wind speeds tend to promote mixing, and generally transport locally generated air emissions away from the area. Inversions restrict vertical movement of the air in the lower atmosphere, thereby preventing atmospheric pollutants from mixing with the air above the inversion layer. Lower mixing heights can be expected to produce high pollutant concentrations since the volume of air with which the pollutants can mix is limited (BLM 1996a; page 3-5).

As is typical of "cold night/hot day" weather patterns, mixing heights can be quite high in the afternoon. Conversely, mixing heights can be quite low at night and early morning due to nighttime cooling. Mixing heights in the Project Area are estimated at 250 feet (annual average) in the morning and approximately 2,400 feet (annual average) in the late afternoon.

Another factor that can be used to assess the ability of the atmosphere to disperse pollutants is atmospheric stability. Atmospheric stability is expressed in terms of Pasquill-Gifford categories ranging from Class A (very unstable) to Class F (very stable), and is a measure of the degree of atmospheric turbulence which results in different levels of atmospheric mixing and resulting in dispersion of pollutants. The greater the instability, the greater the tendency to disperse. Meteorological data from the Cortez Station indicate that good dispersion conditions (Classes A - D) occurred 70 percent of the time during the year 1997, and are representative of on-site conditions.

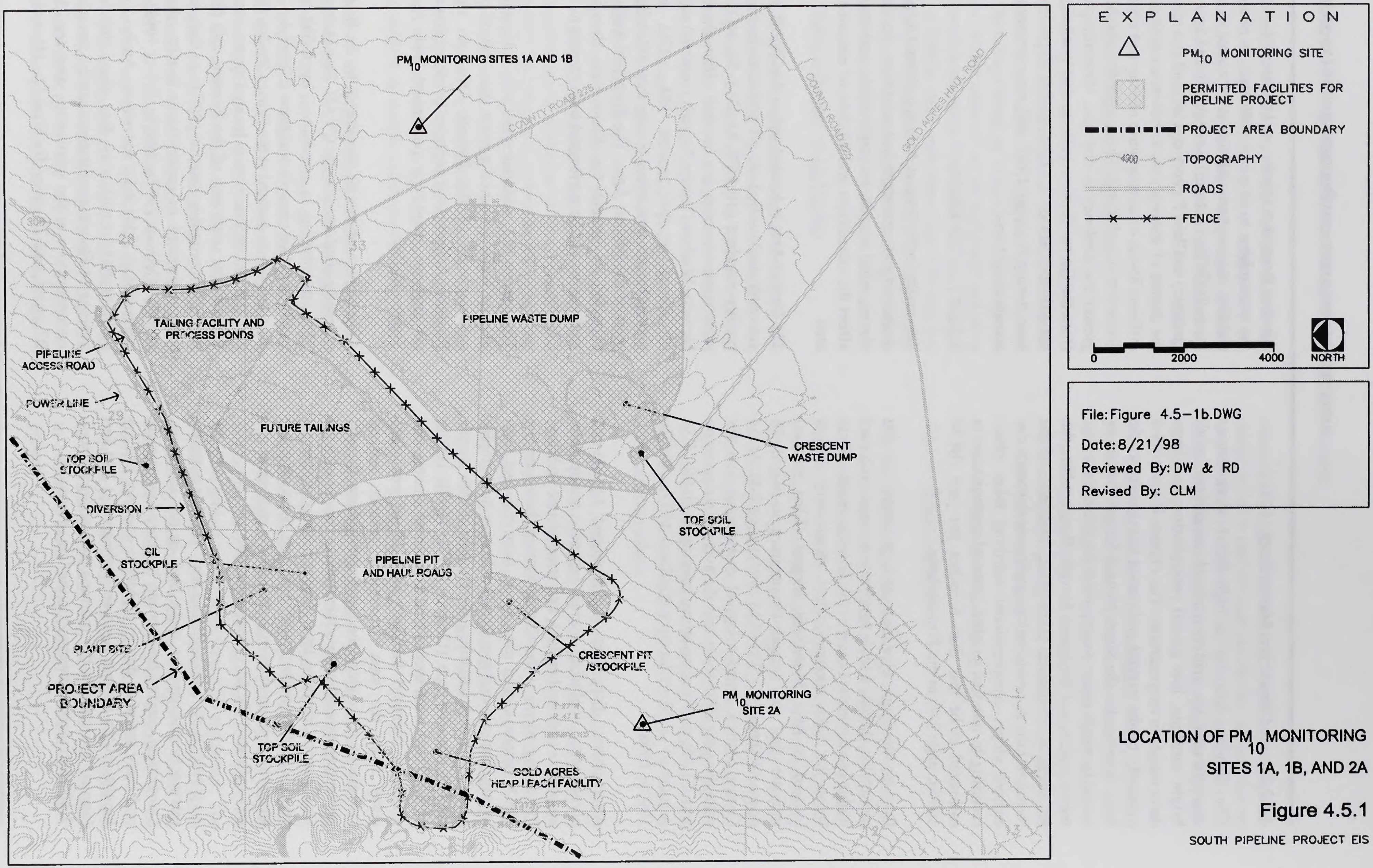
4.5.2.2.2 Air Quality

Air quality in the Project Area is governed by pollutant emissions and meteorological conditions. As discussed above, wind speeds, mixing heights, and stability all affect the circulation and dilution of emissions in the area.

The Project Area is located within the CVAB, which is currently unclassified for all pollutants having an air quality standard (40 CFR 81.329). No NO_2 or lead nonattainment areas are located within the State of Nevada. Washoe County, Nevada (centered on the city of Reno) is the nearest PM_{10}, CO, and O_3 nonattainment area, but is greater than 100 miles to the west of the Project Area. The Proposed Action is not expected to impact the Reno area, therefore, no analyses would be performed with respect to Washoe County.

The nearest SO_2 nonattainment area is located in the Steptoe Valley, located greater than 100 miles to the east-southeast of the Project Area. As such, the Proposed Action is not expected to impact this area and no analyses would be performed with respect to Steptoe Valley.

At present, ambient air monitoring by the BAQ is not currently conducted in the CVAB. However, ambient PM_{10} monitoring is conducted by CGM at three monitors at two separate locations (Figure 4.5.1). Two monitors are co-located at the Cortez Station (Sites 1A and 1B) and one monitor is located approximately 1.5 miles to the southwest of the Pipeline mill (Site 2A). Ambient monitoring data for 1997 from these samplers are summarized in quarterly air quality monitoring reports (Gelhaus 1997a; 1997b; 1997c; 1998) and are presented in Table 4.5.2 for review. Analysis of 1997 ambient PM_{10} monitoring data show that both the average 24-Hour concentrations and the annual average concentrations at the monitoring sites are 25 $\mu g/m^3$, 27 $\mu g/m^3$, and 22 $\mu g/m^3$ for Sites 1A, 1B, and 2A,



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Reviewed By: DW & RD

Revised By: CLM

LOCATION OF PM_{10} MONITORING SITES 1A, 1B, AND 2A

Figure 4.5.1

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Table 4.5.2: Ambient PM_{10} Monitoring Data from Sites 1A, 1B, and 2A

Date	PM_{10} Concentration ($\mu g/m^3$)		
	Site 1A	Site 1B	Site 2A
01/04/97	10	---	7
01/10/97	16	18	9
01/16/97	54	57	83
01/22/97	25	29	4
01/28/97	6	5	5
02/03/97	8	8	13
02/09/97	6	5	16
02/15/97	16	19	9
02/21/97	19	17	15
02/27/97	7	7	1
03/05/97	25	22	---
03/11/97	77	68	---
03/17/97	49	53	19
03/23/97	13	14	51
03/29/97	17	20	---
04/04/97	24	21	---
04/10/97	8	7	16
04/16/97	28	28	52
05/04/97	33	31	---
05/10/97	37	34	45
05/16/97	30	26	30
05/22/97	36	34	52
05/28/97	30	25	20
06/03/97	42	41	37
06/09/97	12	11	18
06/11/97	30	30	9
06/15/97	9	9	---
06/21/97	46	37	---
06/27/97	---	---	29
07/01/97	---	14	---
07/03/97	5	---	27
07/09/97	6	70	16
07/15/97	---	47	22
07/21/97	51	40	21
07/27/97	29	25	35

(*Continued on next page*)

Date	PM$_{10}$ Concentration ($\mu g/m^3$)		
	Site 1A	Site 1B	Site 2A
08/02/97	30	24	23
08/08/97	119	93	20
08/14/97	38	35	---
08/20/97	53	87	---
08/26/97	---	---	29
09/01/97	26	26	27
09/07/97	29	30	37
09/13/97	24	23	6
09/19/97	1	---	5
09/25/97	15	15	16
10/19/97	9	10	34
10/25/97	8	8	12
10/31/97	11	15	7
11/06/97	7	11	42
11/12/97	6	7	4
11/18/97	11	10	15
11/24/97	18	20	14
11/30/97	3	5	16
12/06/97	3	5	12
12/12/97	13	11	22
12/18/97	1	1	6
12/24/97	1	1	15
12/30/97	6	3	17
Average	28	29	22

respectively. The highest measured 24-Hour PM$_{10}$ concentration at the three sites were 119 $\mu g/m^3$, 93 $\mu g/m^3$, and 83 $\mu g/m^3$, for Sites 1A, 1B, and 2A, respectively, while the lowest measured 24-Hour PM$_{10}$ concentration during 1997 at all three sites was 1 $\mu g/m^3$. The concentrations are representative of the ambient air quality conditions in the Project Area as a result of the Pipeline project, which began operations in the spring of 1997.

4.5.3 Environmental Consequences and Mitigation Measures

The Proposed Action would not increase emissions from the permitted air pollutant sources above the levels specified in the permit, nor would additional sources of air pollutants requiring a permit be added as a result of the Proposed Action. Thus, a revised air quality permit would not be required for the Proposed Action.

Assuming the Proposed Action would not increase emissions of any regulated pollutant from PSD applicable sources above 250 tpy, the Proposed Action would not be subject to the PSD regulations. Additionally, the Proposed Action would not add additional sources applicable to the NSPS regulations, and would not be subject to the Title V application requirements.

4.5.3.1 <u>Significance Criteria</u>

The Proposed Action would have a significant effect on the environment if the following would occur:

- Violate any regulatory requirement of the BAQ;

- Violate any state or federal ambient air quality standard;
- Contribute substantially to an existing or projected air quality violation; or
- Expose sensitive receptors to substantial pollutant concentrations.

4.5.3.2 Assessment Methodology

In assessing the impacts of the Proposed Action and Project Alternatives, an assessment of the significance of the impacts was made based on the significance criteria listed above. The air quality analyses quantified the emissions of the applicable criteria pollutants from the Proposed Action and facilities directly related to the processing of ore from the Proposed Action (i.e., the existing Cortez Facility CFB roaster, CIL mill, and tailings facility). Air emission estimates were calculated based on the maximum material throughput for each applicable time period, EPA approved emission factors, existing air quality permits and past air quality permit applications for both the Pipeline project and the Cortez Facility, and information provided by CGM.

4.5.3.2.1 Model Selection and Options

Emissions estimations were used to conduct air quality dispersion modeling using EPA's Industrial Source Complex - Short Term (ISCST3) (EPA Version 97363) dispersion model, utilizing the Trinity Consultants, Inc. BreezeAir™ for Windows® (Version 2.23) graphical front-end. According to the Guideline on Air Quality Models (as Revised) (40 CFR 51, Appendix W), the ISC3 Model is approved for use for representing sources similar to those within the Project Area and with terrain similar to that found within and adjacent to the Project Area. The ISC3 Model is used to calculate concentrations at specific receptor points in and around the Project Area in which elevations are located at stack height or below (Simple Terrain); between the stack height and the plume centerline (Intermediate Terrain); or above the plume centerline (Complex Terrain).

The dispersion modeling used the EPA's regulatory default model options as outlined in Appendix A of the *Guideline on Air Quality Models* (as Revised) (40CFR51, Appendix W), includes the following:

- Use stack-tip downwash;
- Use buoyancy-induced dispersion;
- No gradual plume rise;
- Use calms processing routines;
- Use default wind profile exponents; and
- Use default vertical potential temperature gradients.

The following additional model options were used:

- Rural dispersion parameters; and
- Concentration values were calculated for elevated terrain and surface-based receptors (No flagpole receptors).

Where applicable, and where the information was readily available, EPA's Building Profile Input Program (BPIP) algorithm was used to account for the downwash of point sources due to nearby buildings and/or structures.

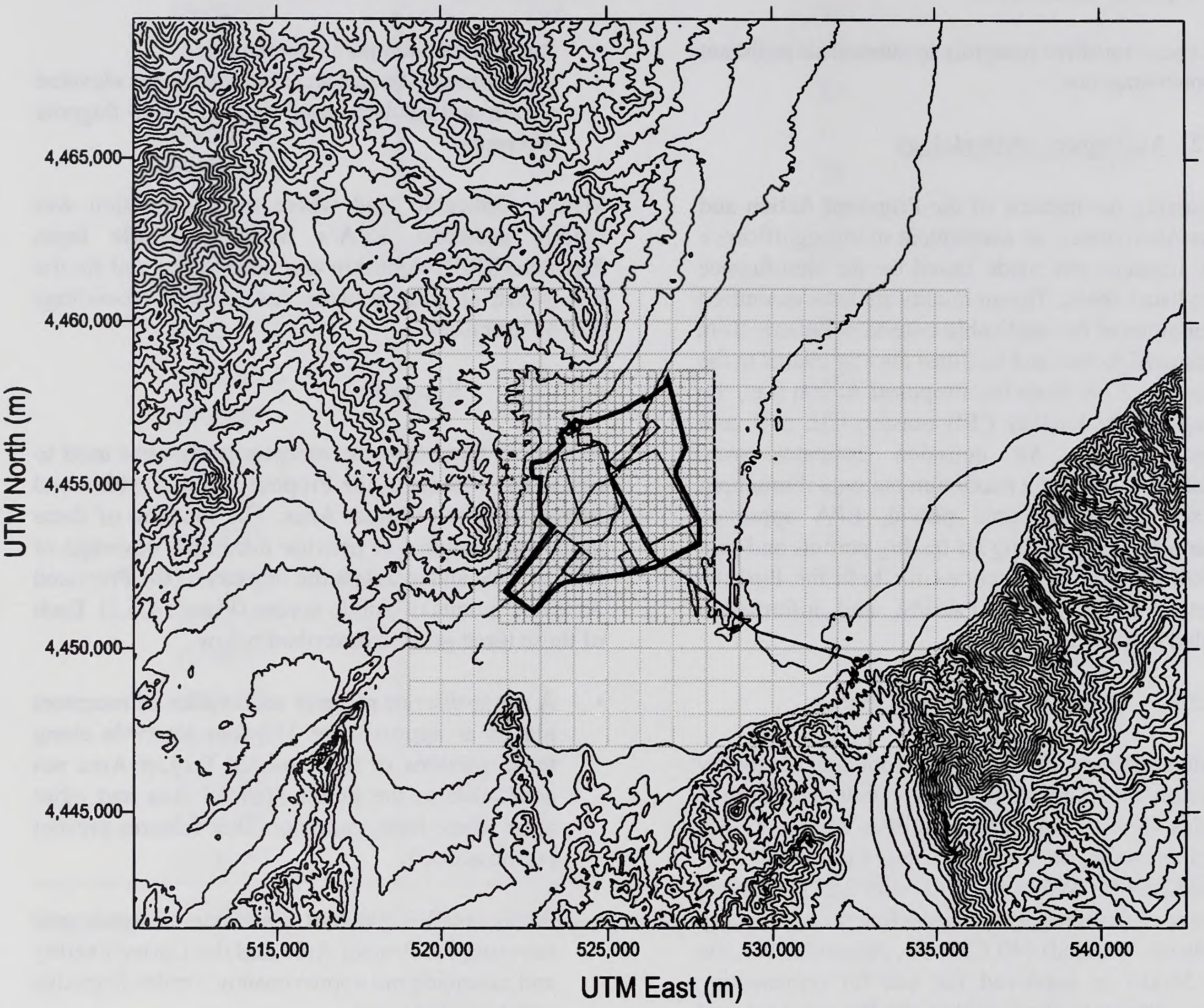
4.5.3.2.2 Receptors

A total of three separate receptor grids were used to assess the impacts of the Proposed Action within and surrounding the Project Area. The location of these grids was designed to provide maximum coverage of Project Area and to assess the impacts of the Proposed Action at points of public access (Figure 4.5.2). Each of these three grids is described below.

- A single discrete receptor set consists of receptors placed at approximate 165-foot intervals along those portions of the modeled Project Area not accessible to the public (fenced area and other areas where topographic or other features prevent public access);
- A "coarse" 3,300-foot Cartesian receptor grid covering the Project Area and the Cortez Facility and extending out approximately 2 miles from this area boundary; and
- A "fine" 825-foot Cartesian grid covering selected areas of "high" concentrations within the 3,300-foot grid.

Elevations for all of the receptors were taken from the USGS Digital Elevation Model (DEM) data for the following 7.5 Minute Series (Topographic) Maps, as applicable:

- Cortez, NV Quadrangle;
- Cortez Canyon, NV Quadrangle;
- Tenabo, NV Quadrangle;
- East of Tenabo, NV Quadrangle;
- Ferris Creek, NV Quadrangle;
- Rocky Pass, NV Quadrangle;



EXPLANATION

Modeled Fenceline

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Date: 08/21/98
Reviewed By: DW & RD
Revised by: CLM

Modeled Sources, Fenceline (Discrete) Receptors, and Cartesian Receptor Locations

Figure 4.5.2

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An additional set of receptors was also utilized in separate model runs to assess the impact of the Proposed Action on defined sensitive receptors. Separate model runs were used, due to the limitations of the BreezeAir™ modeling software. The selected sensitive receptors are as follows:

- Filippini Ranch;
- Tenabo Ranch;
- Wintle Ranch;
- Dean Ranch;
- Dann Ranch;
- Crescent Valley School;
- Beowawe School; and
- Jarbidge Wilderness (the nearest Class 1 area; four receptors were aligned along the nearest Wilderness boundary, with elevations ranging from the lowest to the highest within the Wilderness Area).

Elevations for these receptors were obtained from appropriate USGS 7.5 Minute topographic map.

4.5.3.2.3 Meteorological Data

Surface meteorological data representative of the Project Area are required to perform air quality dispersion modeling. These data are available from several sources, including the current Cortez Station and the Elko Station. As previously stated, the Cortez Station monitors wind speed, wind direction, and temperature, and is located adjacent to the Project Area. Unfortunately, the algorithms used in the air quality dispersion modeling require additional measured parameters that were not collected at the Cortez Station; thus, meteorological data from the Elko Station, which are believed representative of conditions in northeast Nevada, were used in the air quality analysis. According to the *Guideline on Air Quality Models (as Revised)*, air quality modeling analyses utilizing five years of representative meteorological data are acceptable if site specific data are unavailable. The longer term of data, versus 1 year of on-site data, are recommended to ensure that anomalous years of data do not advantageously affect a source, and thus ensures that the NAAQS and SAAQS are protected.

In addition to surface meteorological data, mixing height data representative of the Project Area are also required to create a meteorological data file for use in the air quality dispersion modeling. These data, as well as surface meteorological data from the Elko Station, are available from EPA's Support Center for Regulatory Air Models (SCRAM) web site (http://:www.epa.gov/scram001/). Review of the mixing height data from SCRAM for stations in Nevada show that mixing height data have only been collected at two sites: at Desert Rock, located in extreme southern Nevada, and at the Winnemucca airport, in north-central Nevada. The data from the Winnemucca airport are representative of conditions in the great basin area, and were used as representative mixing height data.

As previously stated, a total of five years of Elko surface and Winnemucca mixing height data were utilized in the modeling analysis. In general, SCRAM contains meteorological data through the year 1992, however, Elko surface data for 1987 and Winnemucca mixing height data for 1992 were unavailable; thus data from calendar years 1986, 1988, 1989, 1990, and 1991 were utilized in the modeling analysis.

4.5.3.2.4 Modeled Pollutants and Assumptions

Dispersion modeling was conducted for four air pollutants potentially resulting from the Proposed Action: PM_{10}, CO, NOx, and SO_2. These were the four pollutants that Environmental Management Associates, Inc. (EMA), in consultation with the BLM, identified as having the greatest potential impact as a result of the Proposed Action. Modeling was not performed for these three criteria pollutants: O_3, lead (Pb), and $PM_{2.5}$. As previously stated, detailed emissions information is not available for $PM_{2.5}$, nor is sufficient ambient monitoring data available to characterize the surrounding region; thus, no dispersion modeling was performed for $PM_{2.5}$.

Ozone is a pollutant generally found within or surrounding urban areas, and requires large sources of NOx (such as an urban automobile fleet), volatile organic compounds (VOCs; also from an urban automobile fleet), and sunlight to create elevated levels. Considering that the nearest O_3 nonattainment area, and the nearest large urban area, are in Reno, Nevada, it was not considered necessary to analyze for O_3.

Lead is an air pollutant that can potentially be emitted from certain facilities. However, lead emissions from the existing Pipeline project and Proposed Action are considered to be negligible and therefore, no analyses were performed with respect to lead.

The nature of the existing facilities and the Proposed Action result in numerous sources of air pollutants. In order to analyze the impacts of the Proposed Action, assumptions had to be made in many different areas, including facility configuration, haul road locations, and the quantities of material processed and/or handled at certain locations (such as how much material is transported per day to the Pipeline leach pad, how

much is transported to the Cortez facilities, etc.). The assumptions, as well as all supporting documentation relating to the air quality analysis performed for this document, are contained in the *South Pipeline Project Air Quality Impact Assessment Report* (EMA 1998). A copy of the report is available for review during normal business hours at the BLM Battle Mountain Field Office.

4.5.3.2.5 Applicable Air Quality Standards

As discussed previously, and shown in Table 4.5.1, state ambient air quality standards (SAAQS) and federal ambient air quality standards (NAAQS) exist for PM_{10}, CO, NOx, and SO_2. Dispersion modeling for the Proposed Action utilized all identified sources and was performed for all four pollutants for all applicable averaging times. The results of the dispersion modeling were then compared to the most stringent SAAQS or NAAQS. For the short term modeling results (e.g., 1-Hour, 3-Hour, 8-Hour, and 24-Hour averaging times), the SAAQS were the most stringent and the modeled results were compared against those standards. For the long term modeling (e.g., annual averaging time), the SAAQS and the NAAQS were equally stringent. A list of the most stringent standards applied to the air quality modeling analysis is provided in Table 4.5.3. Details of the dispersion modeling and analysis are discussed in EMA (1998).

4.5.3.2.6 Background Concentrations

To assess the impact of the Proposed Action on the ambient air quality, it was necessary to accurately account for existing natural, or "background", levels of pollutants. For PM_{10}, the BAQ generally utilizes a "background" value of 10.2 $\mu g/m^3$, for both 24-Hour PM_{10} concentrations and annual average PM_{10} concentrations. However, the ambient PM_{10} monitoring performed at the current Pipeline project, as previously discussed, has included the operation of a PM_{10} monitor located generally upwind of the existing Pipeline project (Site 2A). Monitoring from this site, during calendar year 1997, shows that the average 24-Hour PM_{10} concentration was 22 $\mu g/m^3$. For the purposes of this document and the analysis performed in EMA (1998), this value was assumed to be representative of both 24-Hour and annual "background" PM_{10} concentrations.

No ambient monitoring has been performed within Crescent Valley for CO, NO_2, or SO_2, nor does the BAQ specify specific "background" concentrations for these pollutants. Thus, since no information is available on representative "background" concentrations of these pollutants, no background values were added to the modeled concentrations.

4.5.3.3 Proposed Action

The Proposed Action consists of many activities and actions, each of which may have the potential to emit air pollutants. NAC 445B.187 defines 'stationary source' as "...any building, structure, facility, or installation, including temporary sources which emits or may emit any regulated air pollutant that is regulated under ...NAC 445B.001 to NAC 445B.395." NAC 445B.059 further defines "emission unit" as, "...a part of a stationary source that emits or has the potential to emit any regulated air pollutant." A comprehensive list of the sources of air pollutant emissions, resulting either directly from the Proposed Action, as a result of extending current operations through the life of the proposed action, or from facilities indirectly related to the Proposed Action, but are directly related to the processing of ore from the Proposed Action, are presented in Table 4.5.4 (EMA 1998).

The Proposed Action is essentially an extension of the current operations at the Pipeline project, and will allow CGM to develop the South Pipeline ore deposit. This Action would result in expanding the existing Pipeline open pit to encompass the South Pipeline ore deposit, expansion of the existing Pipeline waste rock dump and the Pipeline tailings facility, and to create the proposed South Pipeline heap leach pad, in addition to continuing the current operations of hauling ore to the existing Pipeline leach pad, the Pipeline Mill, or the Cortez Facility.

4.5.3.3.1 Environmental Consequences and Mitigation Measures

PM_{10} Emissions

PM_{10} emissions are generated by almost all the sources listed in Table 4.5.4, although the largest single source of PM_{10} is the resuspension of unpaved road dust from haul trucks. The haul trucks (ranging in size from 85 to 320 tons, empty weight and carrying capacity) are used to transport material from the open pit to the waste rock dump and the ore processing facilities. PM_{10} emissions from the unpaved haul roads are controlled using a combination of chemical dust suppressant and water. The suppressant is applied approximately every two weeks during the summer, or dusty months, and as environmental conditions warrant during the winter. Water is applied daily during summer and as conditions warrant during winter. In addition to resuspended road dust, the haul trucks also produce combustion, or

Table 4.5.3: List of the Most Stringent Air Quality Standards Applied to the Air Quality Modeling Analysis

Pollutant	Averaging Time	Most Stringent Concentration [a]	SAAQS or NAAQS
Particulate Matter of Aerodynamic Diameter less than 10 Micrometers (PM_{10})	24-Hour	150 $\mu g/m^3$	SAAQS
	Annual	50 $\mu g/m^3$	Both
Carbon Monoxide (CO)	1-Hour	40,000 $\mu g/m^3$	SAAQS
	8-Hour (< 5,000')	10,000 $\mu g/m^3$	SAAQS
	8-Hour (≥ 5,000')	6,667 $\mu g/m^3$	SAAQS
Nitrogen Dioxide (NO_2)	Annual	100 $\mu g/m^3$	Both
Sulfur Dioxide (SO_2)	3-Hour	1,300 $\mu g/m^3$	SAAQS
	24-Hour	365 $\mu g/m^3$	SAAQS
	Annual	80 $\mu g/m^3$	Both

[a] All concentrations are based on the highest modeled concentration at any point of public access.

tailpipe, PM_{10} emissions. Other major sources of PM_{10} emissions include wind erosion (or wind blowing across exposed dirt surfaces) of the waste rock dump, the leach pads, and the ore storage piles, processing material using crushers, screens, and conveyors, and emissions from blasting operations. Ongoing reclamation activities and leaching operations minimize PM_{10} emissions from the waste rock dump and the leach pads, respectively, while high moisture ore, water sprays, and an agglomerated dust reduction system minimize emissions from the material process equipment (i.e., crushers, screens, conveyors, etc.).

The control measures substantially reduce fugitive dust emissions from the Proposed Action, resulting in the maximum modeled ambient PM_{10} concentration, at any point of public access, of 113 $\mu g/m^3$ per 24-Hour time period, and 8.9 $\mu g/m^3$, annual arithmetic mean. These predicted impacts are below both the SAAQS and the NAAQS, even with the site-specific background concentration of 22 $\mu g/m^3$ added. Figures showing isopleths of the highest 24-Hour and annual PM_{10} concentrations, without the addition of background concentrations, are shown in Figures 4.5.3 and 4.5.4.

Dispersion modeling was also performed to determine the impacts of the "sensitive" receptors listed in Section 4.5.3.2.2. The highest 24-Hour PM_{10} impact from the Proposed Action on the defined sensitive receptors was found to be 42.8 $\mu g/m^3$ at the Wintle ranch, approximately eight miles northeast of the Pipeline mill. While this value is elevated above "background" concentrations, it represents the highest single 24-Hour impact. The next highest impact at the Wintle ranch, referred to as the highest 2nd high concentration, is 7.7 $\mu g/m^3$. The 42.8 $\mu g/m^3$ value is anomalously high compared to all the other model results at the "sensitive" receptor, therefore, the 7.7 $\mu g/m^3$ value is more likely a representative value for the potential 24-Hour PM_{10} impact at the Wintle ranch. This small value is most likely to be indistinguishable from existing PM_{10} concentrations within the CVAB.

The highest annual PM_{10} impact from the Proposed Action on the sensitive receptors was found to be 0.97$\mu g/m^3$, also at the Wintle ranch. The value is below the EPA's defined annual PM_{10} modeling significance level of 1 $\mu g/m^3$, and will also be indistinguishable from existing PM_{10} concentrations within the CVAB.

The highest 24-Hour and annual PM_{10} concentrations at the Jarbidge Wilderness Area were 0.38 $\mu g/m^3$ and 0.009 $\mu g/m^3$, respectively. The values are well below the PSD Class I increments (5 $\mu g/m^3$ and 1 $\mu g/m^3$, 24-Hour and annual averaging times, respectively);

Table 4.5.4: List of Sources Analyzed for the Proposed South Pipeline Project

Emission Unit No.	Emission Unit Description	Pollutants
	SOUTH PIPELINE SOURCES	
Emission Unit Group 1: Mining Activity		
1.001	Drilling - Ore	PM_{10}
1.002	Drilling - Waste	PM_{10}
1.003	Ammonium Nitrate Prill Silo Loading	PM_{10}
1.004	Ammonium Nitrate Prill Silo Unloading	PM_{10}
1.005	Blasting - Ore	PM_{10}
1.006	Blasting -Waste	PM_{10}
1.007	Explosive Detonation - Ore Blasting	CO, SO_2, NOx
1.008	Explosive Detonation - Waste Blasting	CO, SO_2, NOx
1.009	Loading - Ore	PM_{10}
1.01	Loading - Waste	PM_{10}
1.011	Loaders (Pit) - *Combustion*	CO, PM_{10}, SO_2, VOCs, NOx
1.012	Hauling of Ore - South Pipeline Pit to Pipeline Mill	PM_{10}
1.013	Hauling of Ore - South Pipeline Pit to Cortez CFB Roaster	PM_{10}
1.014	Hauling of Ore - South Pipeline Pit to Cortez CIL Mill	PM_{10}
1.015	Hauling of Ore - South Pipeline Pit to Pipeline Leach Pad	PM_{10}
1.016	Hauling of Ore - South Pipeline Pit to SP Leach Pad	PM_{10}
1.017	Hauling of Ore to Pipeline Mill - *Combustion*	CO, PM_{10}, SO_2, VOCs, NOx
1.018	Hauling of Ore to Cortez CFB Roaster - *Combustion*	CO, PM_{10}, SO_2, VOCs, NOx
1.019	Hauling of Ore to Cortez CIL Mill - *Combustion*	CO, PM_{10}, SO_2, VOCs, NOx
1.020	Hauling of Ore to Pipeline Leach Pad - *Combustion*	CO, PM_{10}, SO_2, VOCs, NOx
1.021	Hauling of Ore to SP Leach Pad - *Combustion*	CO, PM_{10}, SO_2, VOCs, NOx
1.022	Unloading Ore - Pipeline Mill	PM_{10}
1.023	Unloading Ore - Cortez CFB Roaster	PM_{10}
1.024	Unloading Ore - Cortez CIL Mill	PM_{10}
1.025	Hauling of Waste - Haul SP Waste to SP Waste Dump	PM_{10}
1.026	Hauling of Waste - SP Waste Dump - *Combustion*	CO, PM_{10}, SO_2, VOCs, NOx
1.027	Unloading of Waste - South Pipeline Waste Rock Dump	PM_{10}
1.028	Waste Dozing - South Pipeline Waste Rock Dump	PM_{10}
1.029	Waste Dozers - SP Waste Dump - *Combustion*	CO, PM_{10}, SO_2, VOCs, NOx
1.030	Hydraulic Shovel - *Combustion*	CO, PM_{10}, SO_2, VOCs, NOx
1.031	Rotary Drills - *Combustion*	CO, PM_{10}, SO_2, VOCs, NOx
1.032	Motor Grader - *Combustion*	CO, PM_{10}, SO_2, VOCs, NOx
1.033	Blasting Trucks - *Combustion*	CO, PM_{10}, SO_2, VOCs, NOx
1.034	Water Trucks - *Combustion*	CO, PM_{10}, SO_2, VOCs, NOx
1.035	Water Trucks - Fugitive Emissions	PM_{10}

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Emission Unit No.	Emission Unit Description	Pollutants
1.036	Wind Erosion - South Pipeline Waste Rock Dump	PM_{10}
1.037	Wind Erosion - Ore Storage Piles	PM_{10}
Emission Unit Group 2: Pipeline/South Pipeline Heap Leaching		
2.001	Unloading Ore - Pipeline Leach Pad	PM_{10}
2.002	Unloading Ore - South Pipeline Leach Pad	PM_{10}
2.003	Ore Dozing - Pipeline Leach Pad	PM_{10}
2.004	Ore Dozing - South Pipeline Leach Pad	PM_{10}
2.005	Ore Dozing (Pipeline Leach Pad)- *Combustion*	CO, PM_{10}, SO_2, VOCs, NOx
2.006	Ore Dozing (South Pipeline Leach Pad)- *Combustion*	CO, PM_{10}, SO_2, VOCs, NOx
2.007	100 Ton Lime Silo - Loading	PM_{10}
2.008	100 Ton Lime Silo - Unloading	PM_{10}
2.009	Wind Erosion - Pipeline Leach Pad	PM_{10}
2.010	Wind Erosion - South Pipeline Leach Pad	PM_{10}
Emission Unit Group 3: Cortez Gravel Pit		
3.001	Wind Erosion (Gravel Pit)	PM_{10}
Emission Unit Group 4: Permanent Crushing System		
4.001	Loader (Crusher) - *Combustion*	CO, PM_{10}, SO_2, VOCs, NOx
4.002	Crusher Dump Pocket	PM_{10}
4.003	Transfer Dump Pocket to Jaw Crusher (JC) Apron Feeder	PM_{10}
4.004	Transfer from JC Apron Feeder To Conveyor #1	PM_{10}
4.005	Vibrating Grizzly Screen	PM_{10}
4.006	Transfer Grizzly Chute to Conveyor #1	PM_{10}
4.007	Rock Breaker	PM_{10}
4.008	Rock Breaker - *Combustion*	CO, PM_{10}, SO_2, VOCs, NOx
4.009	Jaw Crusher	PM_{10}
4.010	Transfer from Conveyor #1 to Conveyor #2	PM_{10}
4.011	Transfer from Conveyor #2 to Ore Stockpile	PM_{10}
4.012	Transfer Ore Stockpile Apron Feeder #1 to Conveyor #3	PM_{10}
4.013	Transfer Ore Stockpile Apron Feeder #2 to Conveyor #3	PM_{10}
4.014	Wind Erosion - Coarse Ore Stockpile	PM_{10}
Emission Unit Group 5: Wet Grinding		
5.001	Transfer from Conveyor #3 to Wet Mill	PM_{10}
5.002	Wet Mill Lime Silo - Loading	PM_{10}
5.003	Wet Mill Lime Silo - Discharge	PM_{10}
Emission Unit Group 6: Carbon Stripping		
6.001	Carbon Strip Vessels Boiler #1	CO, PM_{10}, SO_2, VOCs, NOx
6.002	Carbon Strip Vessels Boiler #2	CO, PM_{10}, SO_2, VOCs, NOx
6.003	Carbon Strip Vessels Boiler #3	CO, PM_{10}, SO_2, VOCs, NOx
Emission Unit Group 7: Refinery		
7.001	Refinery Induction Furnace #1	PM_{10}

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Emission Unit No.	Emission Unit Description	Pollutants
7.002	Refinery Induction Furnace #2	PM_{10}
7.003	Gold Sludge Dryer Oven	PM_{10}
Emission Unit Group 8: Carbon Reactivation		
8.001	Carbon Reactivation Kiln #1	PM_{10}
8.002	Carbon Reactivation Kiln #2	PM_{10}
Emission Unit Group 9: Mill Lime Handling System		
9.001	Mill Lime Handling System - Loading	PM_{10}
9.002	Mill Lime Handling System - Discharge	PM_{10}
Emission Unit Group 10: Assay Laboratory		
10.001	Sample Prep Truck Oven - Electric	PM_{10}
10.002	Assay Lab Ring Pulverizer #1	PM_{10}
10.003	Assay Lab Ring Pulverizer #2	PM_{10}
10.004	Assay Lab Ring Pulverizer #3	PM_{10}
10.005	Assay Lab Disk Pulverizer #1	PM_{10}
10.006	Assay Lab Disk Pulverizer #2	PM_{10}
10.007	Assay Lab Roll Crusher	PM_{10}
10.008	Assay Lab Jaw Crusher #1	PM_{10}
10.009	Assay Lab Jaw Crusher #2	PM_{10}
10.010	Assay Lab Jaw Crusher #3	PM_{10}
10.011	Assay Lab Transfer to Riffle Reject Conveyor	PM_{10}
10.012	Assay Lab Transfer to Riffle Reject Hopper	PM_{10}
10.013	Sample Prep Walk-in Oven	PM_{10}
10.014	Assay Lab Drying Oven	PM_{10}
10.015	Fire Assay Lab Fusion Furnace #1	PM_{10}
10.016	Fire Assay Lab Fusion Furnace #2	PM_{10}
10.017	Fire Assay Lab Fusion Furnace #3	PM_{10}
10.018	Fire Assay Lab Fusion Furnace #4	PM_{10}
10.019	Fire Assay Lab Fusion Furnace #5	PM_{10}
10.020	Fire Assay Lab Fusion Furnace #6	PM_{10}
Emission Unit Group 11: Storage Tanks (Diesel, Propane, Gasoline, Ethylene Glycol)		
11.001	Diesel Fuel Tanks (Pipeline Shop)	VOCs
11.002	Diesel Fuel Tank (Pipeline Fuel Skid)	VOCs
11.003	Diesel Fuel Tanks (Pipeline Emergency Generators)	VOCs
11.004	Gasoline Tank (Small Vehicle Station)	VOCs
11.005	Propane Tank (Pipeline Mill)	VOCs
11.006	Ethylene Glycol (coolant)	VOCs
Emission Unit Group 12: Standby Generators		
12.001	2,220 HP Stand-By Generator #1	CO, PM_{10}, SO_2, VOCs, NOx
12.002	2,220 HP Stand-By Generator #2	CO, PM_{10}, SO_2, VOCs, NOx
12.003	2,220 HP Stand-By Generator #3	CO, PM_{10}, SO_2, VOCs, NOx

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Emission Unit No.	Emission Unit Description	Pollutants
Emission Unit Group 13: Portable Crushing System		
13.001	Truck Dump to Primary Crusher	PM_{10}
13.002	Primary Crusher	PM_{10}
13.003	Primary Screen	PM_{10}
13.004	Secondary Crusher	PM_{10}
13.005	Transfer Conveyor #7 to Stockpile #1	PM_{10}
13.006	Transfer Conveyor #5 to Radial Stacker #6	PM_{10}
13.007	Transfer Radial Stacker #6 to Stockpile #2	PM_{10}
13.008	Wind Erosion - Stockpile #1	PM_{10}
13.009	Wind Erosion - Stockpile #2	PM_{10}
Emission Unit Group 14: Other Sources		
14.001	Light Plants (Within Pit) - *Combustion*	CO, PM_{10}, SO_2, VOCs, NOx
14.002	Light Plants (Waste Rock) - *Combustion*	CO, PM_{10}, SO_2, VOCs, NOx
CORTEZ MINE SOURCES		
Cortez Emission Unit Group 1: Ore Crushing Circuit		
C1.001	Loader (Crusher) - *Combustion*	CO, PM_{10}, SO_2, VOCs, NOx
C1.002	Wind Erosion - Ore Storage Pile	PM_{10}
C1.003	50 Ton Ore Bin	PM_{10}
C1.004	Transfer from 50 Ton Ore Bin to Hydrastoke Feeder	PM_{10}
C1.005	Hydrastoke Feeder	PM_{10}
C1.006	Transfer from Hydrastoke Feeder to Jaw Crusher	PM_{10}
C1.007	Jaw Crusher	PM_{10}
C1.008	Transfer from Conveyor #1 to Conveyor #2	PM_{10}
C1.009	Transfer from Conveyor #2 to Vibrating Screen	PM_{10}
C1.010	Vibrating Screen	PM_{10}
C1.011	Transfer from Conveyor #3a to Conveyor #3b	PM_{10}
C1.012	Transfer from Conveyor #3a to Conveyor #3	PM_{10}
C1.013	Transfer from Conveyor #3 to Crushed CIL Ore Stockpile	PM_{10}
C1.014	Transfer from Conveyor #3b to Conveyor #10	PM_{10}
C1.015	Transfer from Conveyor #10 to Roast Ore Stockpile	PM_{10}
C1.016	Cone Crusher	PM_{10}
C1.017	Transfer Crushed CIL Ore Stockpile to Conveyor #4A	PM_{10}
C1.018	Transfer from Conveyor #4A to #4B	PM_{10}
C1.019	Transfer from Conveyor #4B to Rod Mill	PM_{10}
C1.020	Transfer from Roast Ore Stockpile to Conveyor #11A	PM_{10}
C1.021	110 Ton Roaster Lime Silo Baghouse	PM_{10}
C1.022	110 Ton Roaster Lime Silo - Discharge	PM_{10}
C1.023	Wind Erosion (Roast Ore Stockpile)	PM_{10}
C1.024	Wind Erosion (Crushed CIL Ore Stockpile)	PM_{10}

(Continued on next page)

Emission Unit No.	Emission Unit Description	Pollutants
Cortez Emission Unit Group 2: Coal Feed System for Roaster		
C2.001	60 Ton Coal Bin & Apron Feeder	PM_{10}
C2.002	Transfer from Coal Bin to Screw Conveyor	PM_{10}
C2.003	Transfer from Screw Conveyor to Conveyor #11B	PM_{10}
C2.004	Transfer from Conveyor #11B to Conveyor #11A	PM_{10}
C2.005	Transfer from Conveyor #11A to Dry Grind SAG Mill Feed Belt	PM_{10}
Cortez Emission Unit Group 3: Dry Grinding System for Roaster		
C3.001	Dry Grinding Process Baghouse - Controlling emissions from the SAG mill, the classifier, two vibrating screens, a bucket elevator, an air preheater, and a surge bin	CO, PM_{10}, SO_2, VOCs, NOx
C3.002	1,400 Ton Ore Storage Silo Baghouse - Controlling emissions from the 1,400 ton ore storage silo and Conveyor #12	PM_{10}
Cortez Emission Unit Group 4: Roasting Circuit		
C4.001	Ore Surge Bin Baghouse	PM_{10}
C4.002	Roaster Venting System	CO, PM_{10}, SO_2, VOCs, NOx
C4.003	Calcine Cooler Wet Scrubber	PM_{10}
Cortez Emission Unit Group 5: Lime Handling System		
C5.001	Lime Handling System - Loading	PM_{10}
C5.002	Lime Handling System - Discharge	PM_{10}
Cortez Emission Unit Group 6: Carbon Strip Circuit		
C6.001	Carbon Reactivation Kiln	CO, PM_{10}, SO_2, VOCs, NOx
C6.002	Carbon Strip Vessels Boiler	CO, PM_{10}, SO_2, VOCs, NOx
Cortez Emission Unit Group 7: Refinery		
C7.001	Wabi Iron Works Furnace #1	CO, PM_{10}, SO_2, VOCs, NOx
C7.002	Wabi Iron Works Furnace #2	CO, PM_{10}, SO_2, VOCs, NOx
C7.003	Denver Fire Clay Furnace	CO, PM_{10}, SO_2, VOCs, NOx
Cortez Emission Unit Group 8: Assay Laboratory		
C8.001	Jaw Crushers	PM_{10}
C8.002	Pulverizers	PM_{10}
C8.003	Electric Furnaces	PM_{10}

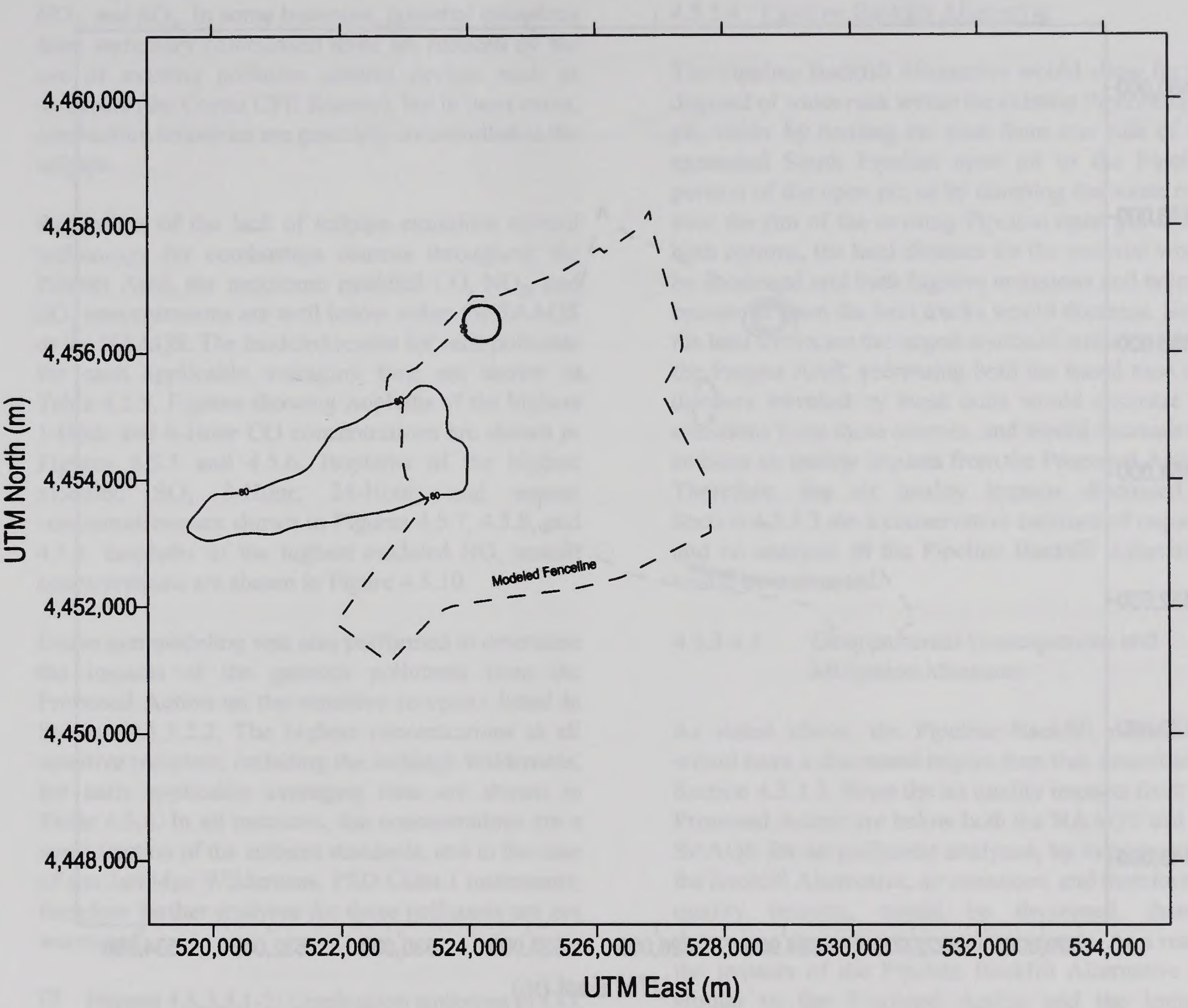
thus no further analyses with respect to the Jarbidge Wilderness Area are warranted.

▣ **Impact 4.5.3.3.1-1:** Fugitive dust (PM_{10}) would be generated by numerous processes as a result of the Proposed Action, including the resuspension of road dust, wind erosion of exposed dirt surfaces, and activities related to the processing of ore materials. The activities are inherent to the mining process and would be ongoing throughout the life of the Proposed Action. The modeled PM_{10} concentrations show levels below the SAAQS and the NAAQS, even with the addition of a site-specific background concentration of 22 $\mu g/m^3$.

Significance of the Impact: This impact is considered less than significant and no mitigation measures are required.

Combustion Emissions

Combustion of diesel in the haul trucks and mobile equipment, such as loaders, dozers, etc., the combustion of propane in processing units such as the



EXPLANATION

— — — Modeled Fenceline

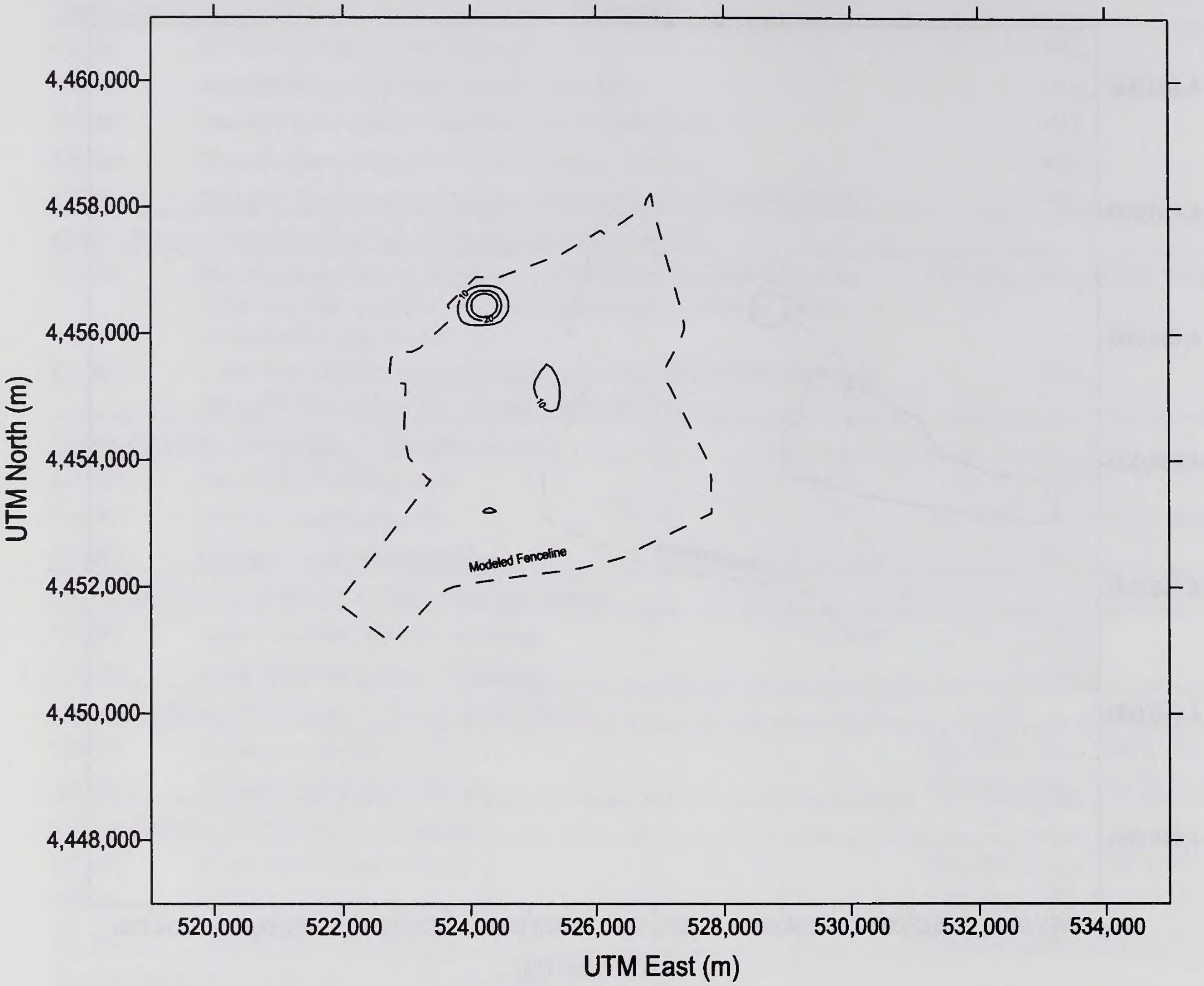
Isopleths Displayed for 80 ug/m3
and 100 ug/m3 Countour Intervals
Ambient 24-Hour PM10 Standard
is 150 ug/m3

File: pm10-24.dwg
Date: 11/18/98
Reviewed By: DNW
Revised by: CLM

Isopleth of the Modeled Highest 24-Hour PM10 Concentrations in Micrograms Per Cubic Meter (ug/m3)

Figure 4.5.3

SOUTH PIPELINE PROJECT EIS



EXPLANATION

— — — Modeled Fenceline

Isopleths Displayed for 10 ug/m3, 20 ug/m3, and 30 ug/m3

Ambient Annual PM10 Standard is 50 ug/m3

File: pm10_an.dwg
Date: 11/18/98
Reviewed By: DNW
Revised by: CLM

Isopleth of the Modeled Highest Annual PM10 Concentrations in Micrograms Per Cubic Meter (ug/m3)

Figure 4.5.4

Carbon Strip Vessels Boilers, and the combustion of fuel oil and/or coal in units such as the Cortez CFB Roaster, would produce elevated ambient levels of CO, NO_2, and SO_2. In some instances, potential emissions from stationary combustion units are reduced by the use of existing pollution control devices such as scrubbers (the Cortez CFB Roaster), but in most cases, combustion emissions are generally uncontrolled at the tailpipe.

Regardless of the lack of tailpipe emissions control technology for combustion sources throughout the Project Area, the maximum modeled CO, NO_2, and SO_2 concentrations are well below either the SAAQS or the NAAQS. The modeled results for each pollutant for each applicable averaging time are shown in Table 4.5.5. Figures showing isopleths of the highest 1-Hour and 8-Hour CO concentrations are shown in Figures 4.5.5 and 4.5.6. Isopleths of the highest modeled SO_2 3-Hour, 24-Hour, and annual concentrations are shown in Figures 4.5.7, 4.5.8, and 4.5.9. Isopleths of the highest modeled NO_2 annual concentrations are shown in Figure 4.5.10.

Dispersion modeling was also performed to determine the impacts of the gaseous pollutants from the Proposed Action on the sensitive receptors listed in Section 4.5.3.2.2. The highest concentrations at all sensitive receptors, including the Jarbidge Wilderness, for each applicable averaging time are shown in Table 4.5.6. In all instances, the concentrations are a small fraction of the ambient standards, and in the case of the Jarbidge Wilderness, PSD Class I increments; therefore further analyses for these pollutants are not warranted.

▣ **Impact 4.5.3.3.1-2:** Combustion emissions of CO, NO_2, and SO_2 would be generated by numerous processes as a result of the Proposed Action, including combustion emissions from diesel engines; and, burning propane, fuel oil, and/or coal in various process equipment. The modeled CO, NO_2, and SO_2 concentrations show levels well below the SAAQS and the NAAQS.

Significance of the Impact: This impact is considered less than significant and no mitigation measures are required.

4.5.3.3.2 Residual Adverse Impacts

The residual adverse impact of the Proposed Action includes combustion emissions of CO, NO_2, and SO_2 generated by numerous processes as a result of the Proposed Action, including combustion emissions from diesel engines; and, burning propane, fuel oil, and/or coal in various process equipment.

4.5.3.4 Pipeline Backfill Alternative

The Pipeline Backfill Alternative would allow for the disposal of waste rock within the existing Pipeline open pit, either by hauling the rock from one side of the expanded South Pipeline open pit to the Pipeline portion of the open pit, or by dumping the waste rock over the rim of the existing Pipeline open pit. Under both options, the haul distance for the material would be shortened and both fugitive emissions and tailpipe emissions from the haul trucks would decrease. Since the haul trucks are the largest source of emissions from the Project Area, decreasing both the travel time and distance traveled by these units would decrease air emissions from these sources, and would decrease the ambient air quality impacts from the Proposed Action. Therefore, the air quality impacts discussed in Section 4.5.3.3 are a conservative estimate of impacts, and no analysis of the Pipeline Backfill Alternative would be warranted.

4.5.3.4.1 Environmental Consequences and Mitigation Measures

As stated above, the Pipeline Backfill Alternative would have a decreased impact than that described in Section 4.5.3.3. Since the air quality impacts from the Proposed Action are below both the NAAQS and the SAAQS for all pollutants analyzed, by implementing the Backfill Alternative, air emissions, and therefore air quality impacts, would be decreased, thereby decreasing the ambient air quality impacts. As a result, the impacts of the Pipeline Backfill Alternative are similar to the Proposed Action and the impacts described in Section 4.5.3.3 are incorporated by reference.

4.5.3.4.2 Residual Adverse Impacts

The residual adverse impact of the Pipeline Backfill Alternative includes combustion emissions of CO, NO_2, and SO_2 generated by numerous processes as a result of the Proposed Action, including combustion emissions from diesel engines; and, burning propane, fuel oil, and/or coal in various process equipment.

4.5.3.5 No Action Alternative

As a result of the No Action Alternative, the existing Pipeline project would continue to operate under current operational conditions, with an expected mine life of eight years. Air emissions, and thus ambient air

Table 4.5.5: List of the Highest Modeled CO, NO_2, And SO_2 Impacts at Any Point of Public Access from the Proposed Action

Pollutant	Averaging Time	Modeled Concentration	Ambient Standard
	1-Hour	2,969 $\mu g/m^3$	40,000 $\mu g/m^3$
Carbon Monoxide (CO)	8-Hour (< 5,000')	72 $\mu g/m^3$	10,000 $\mu g/m^3$
	8-Hour (≥ 5,000')	72 $\mu g/m^3$	6,667 $\mu g/m^3$
Nitrogen Dioxide (NO_2)	Annual	4 $\mu g/m^3$	100 $\mu g/m^3$
	3-Hour	114 $\mu g/m^3$	1,300 $\mu g/m^3$
Sulfur Dioxide (SO_2)	24-Hour	33 $\mu g/m^3$	365 $\mu g/m^3$
	Annual	3 $\mu g/m^3$	80 $\mu g/m^3$

quality impacts, from the existing Project would not be expected to increase over current levels, and therefore, no additional air quality impacts would occur.

4.5.3.5.1 Environmental Consequences and Mitigation Measures

Air quality impacts under the No Action Alterative are similar to those outlined in the Pipeline project FEIS (BLM; 1996a).

4.5.3.5.2 Residual Adverse Impacts

The residual adverse impact of the Proposed Action includes combustion emissions of CO, NO_2, and SO_2 generated by numerous processes as a result of the Proposed Action, including combustion emissions from diesel engines; and, burning propane, fuel oil, and/or coal in various process equipment. No residual adverse impacts would be expected to occur as a direct result of the No Action Alternative.

4.6 Range Resources

4.6.1 Regulatory Framework

The Shoshone-Eureka Rangeland Program Summary (BLM 1988) and the Resource Management Plan for the Shoshone-Eureka Resource Area (1986a) are long-range plans developed by the BLM and are intended to develop and manage 4.3 million acres of public land within the Shoshone-Eureka Resource Area. The plans have been prepared in response to Sections 202 and 603 of the FLPMA that require the BLM to develop land use plans for the public lands. The Project Area is located within the Carico Lake Allotment administered by the BLM's Battle Mountain Field Office.

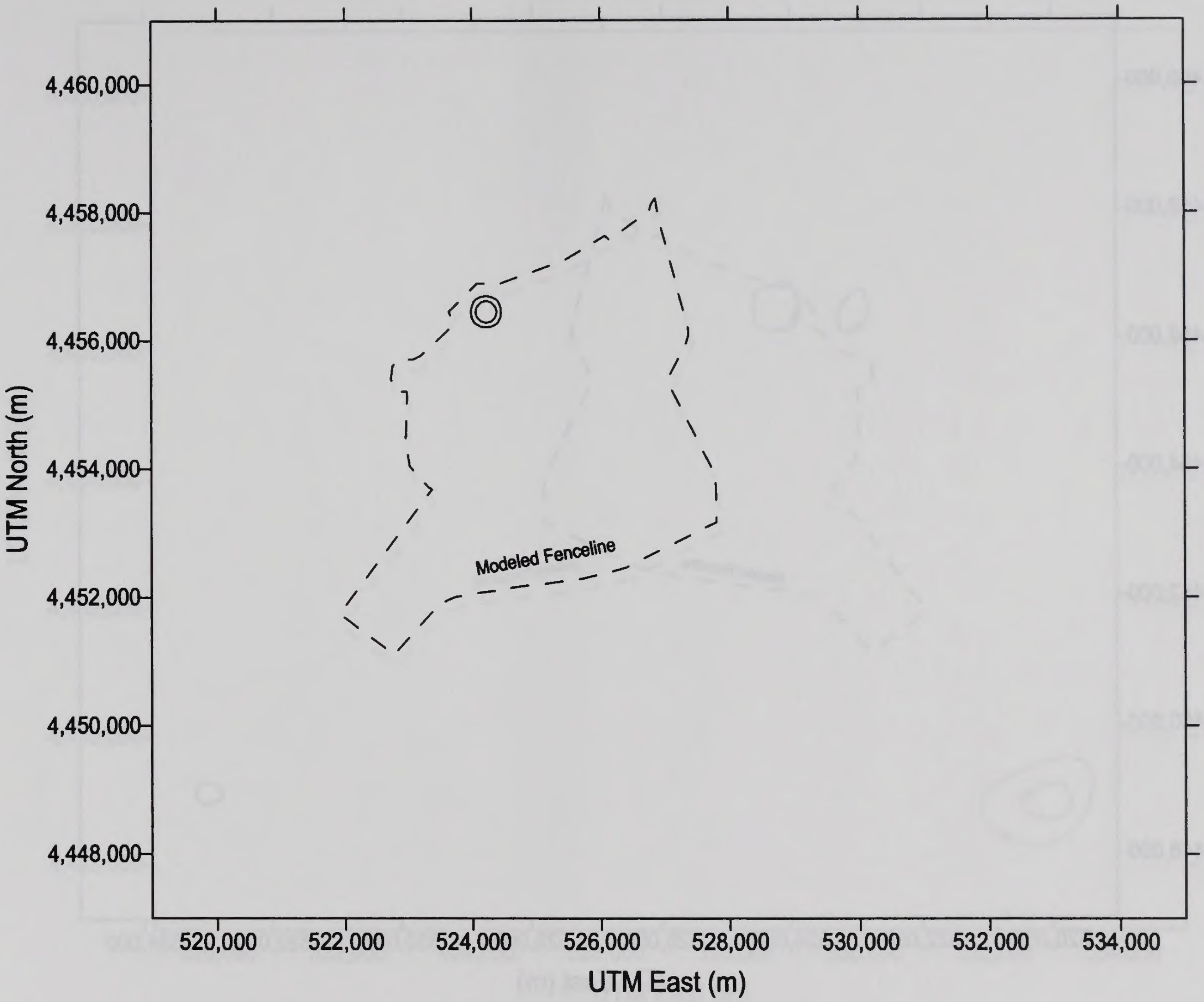
There is no management plan established for the Carico Lake Allotment. The Battle Mountain Field Office is currently developing an allotment evaluation for the Carico Lake Allotment. The evaluation, when completed, will include individual grazing plans for each of the permittees within the allotment.

4.6.2 Affected Environment

The Project Area is located within the Carico Lake Allotment administered by the BLM's Battle Mountain Field Office. The study area for range resources includes the Project Area and the remainder of the Carico Lake Allotment (Figure 4.6.1).

4.6.2.1 Study Methods

This section includes a discussion of existing grazing allotments, permits, types and classes of livestock, Active Grazing Preference, as well as the current grazing practices and management strategies within the study area. Discussions of range improvements and wild horse utilization in the Pipeline project FEIS (BLM 1996a; pages 3-53 and 3-54) are herein incorporated by reference.



EXPLANATION

— — — Modeled Fenceline

Isopleths Displayed for 20,000 ug/m3 and 40,000 ug/m3 Countour Intervals

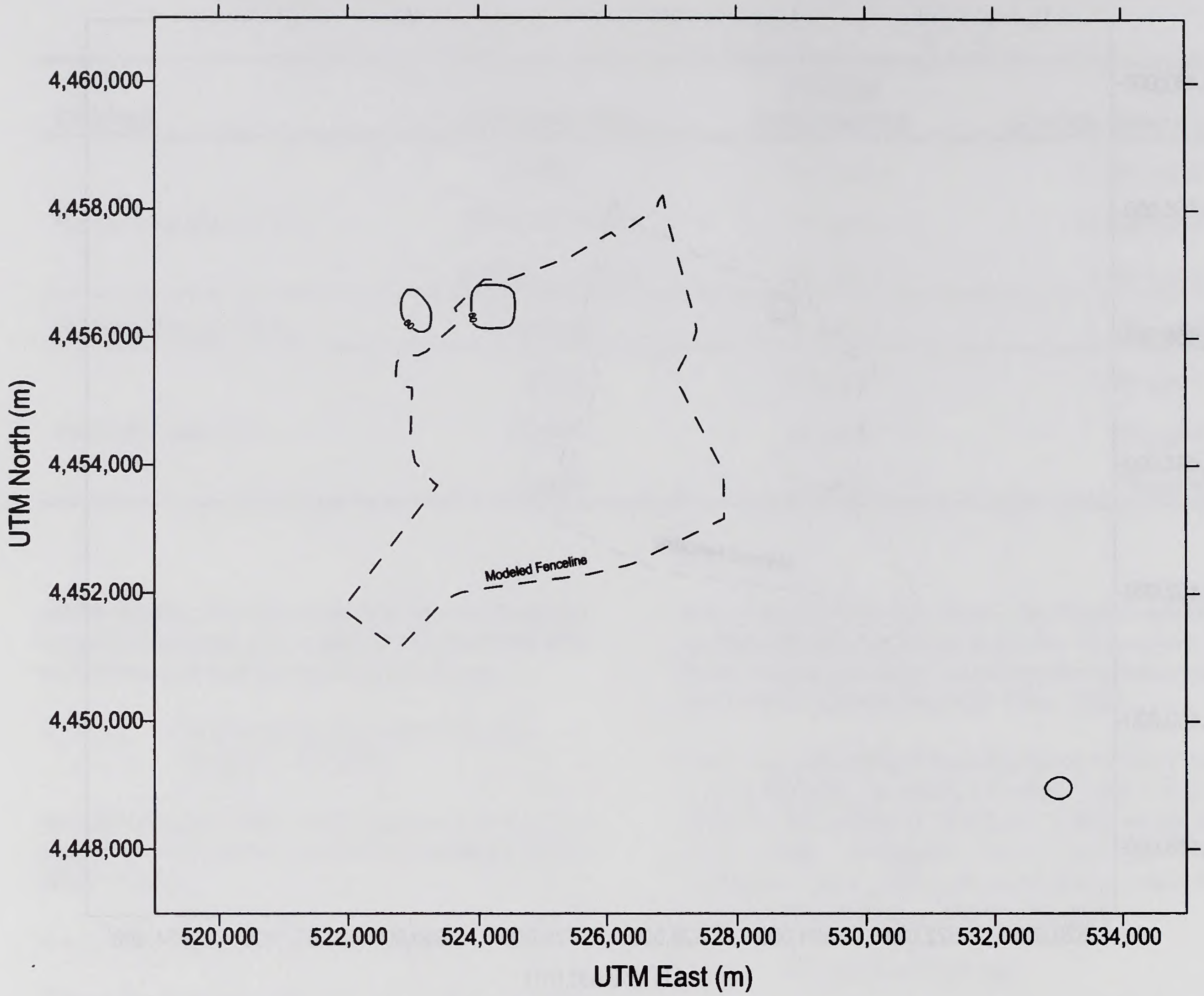
Ambient 1-Hour CO Standard is 40,000 ug/m3

File: co-1h.dwg
Date: 11/18/98
Reviewed By: DNW
Revised by: CLM

Isopleth of the Modeled Highest 1-Hour CO Concentrations in Micrograms Per Cubic Meter (ug/m3)

Figure 4.5.5

SOUTH PIPELINE PROJECT EIS



EXPLANATION

— — — Modeled Fenceline

Isopleth Displayed for 60 ug/m3

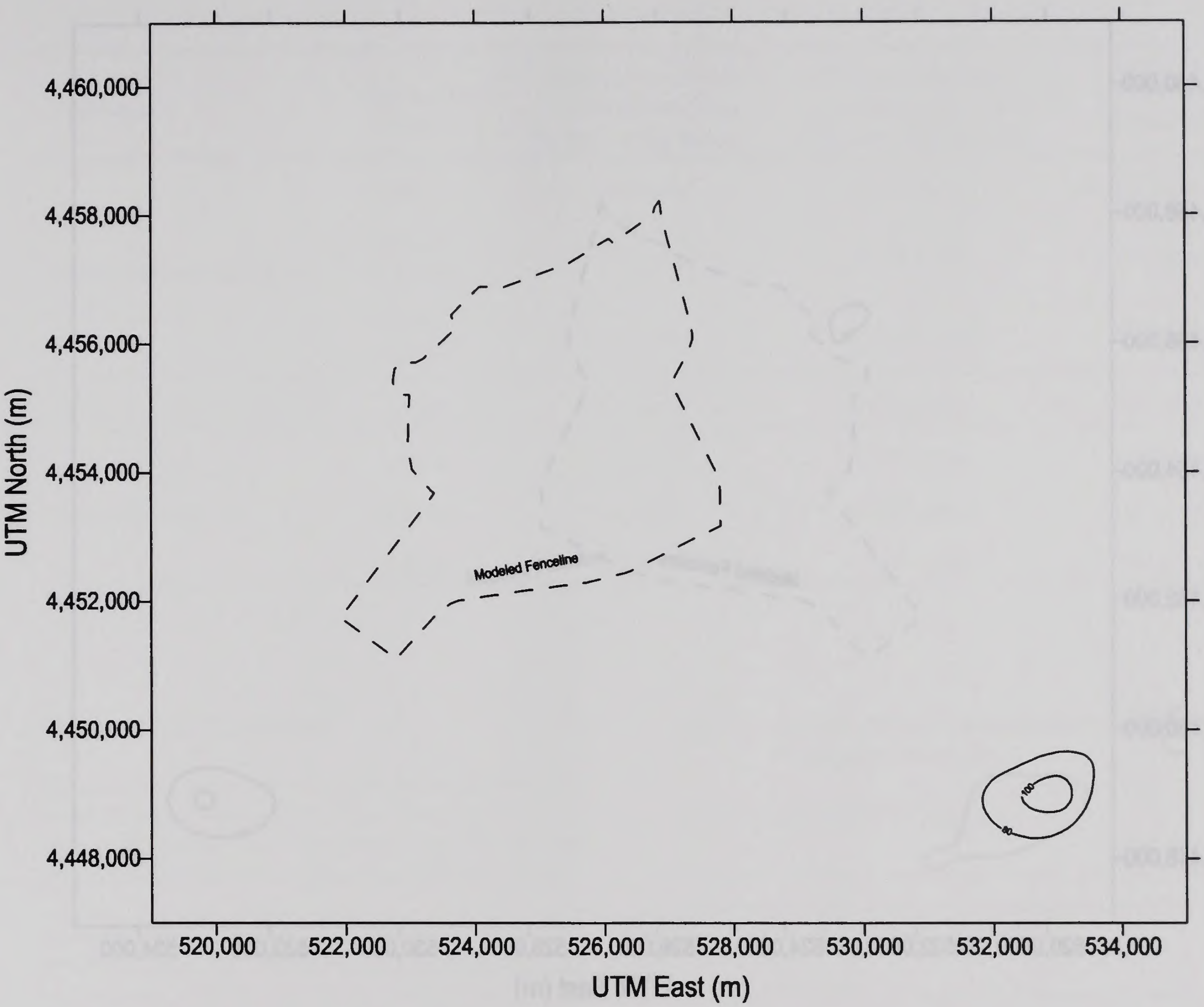
Ambient 8-Hour CO Standard is 6,667 ug/m3

File: co-8hr.dwg
Date: 11/18/98
Reviewed By: DNW
Revision by: CLM

Isopleth of the Modeled Highest 8-Hour CO Concentrations in Micrograms Per Cubic Meter (ug/m3)

Figure 4.5.6

SOUTH PIPELINE PROJECT EIS



EXPLANATION

— — — Modeled Fenceline

Isopleths Displayed for 80 ug/m3 and 100 ug/m3

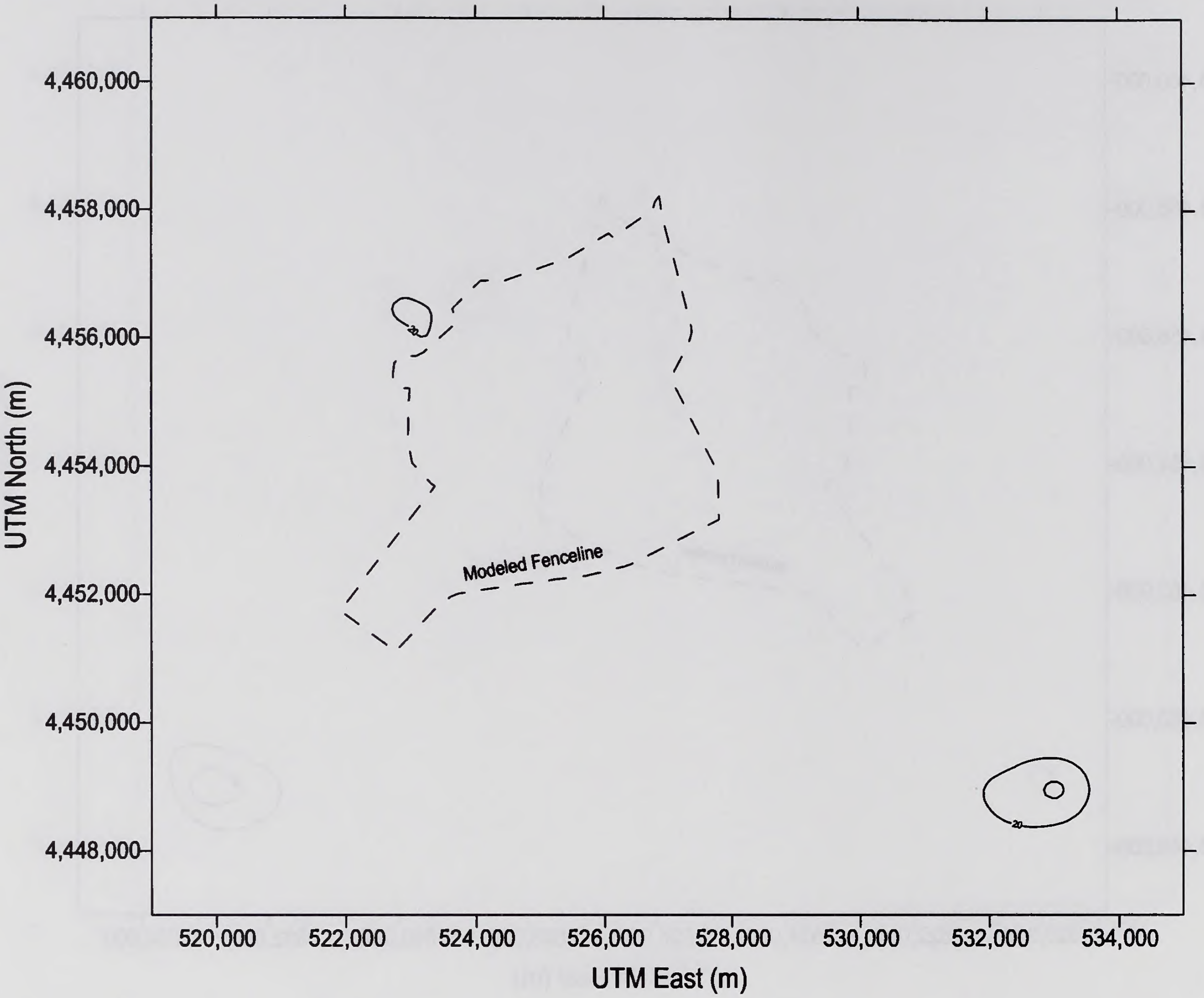
Ambient 3-Hour SO2 Standard is 1,300 ug/m3

File: so23hr91.dwg
Date: 11/18/98
Reviewed By: DNW
Revised by: CLM

Isopleth of the Modeled Highest 3-Hour SO2 Concentrations in Micrograms Per Cubic Meter (ug/m3)

Figure 4.5.7

SOUTH PIPELINE PROJECT EIS



EXPLANATION

— — — Modeled Fenceline

Isopleths Displayed for 20 ug/m3 and 30 ug/m3 Countour Intervals

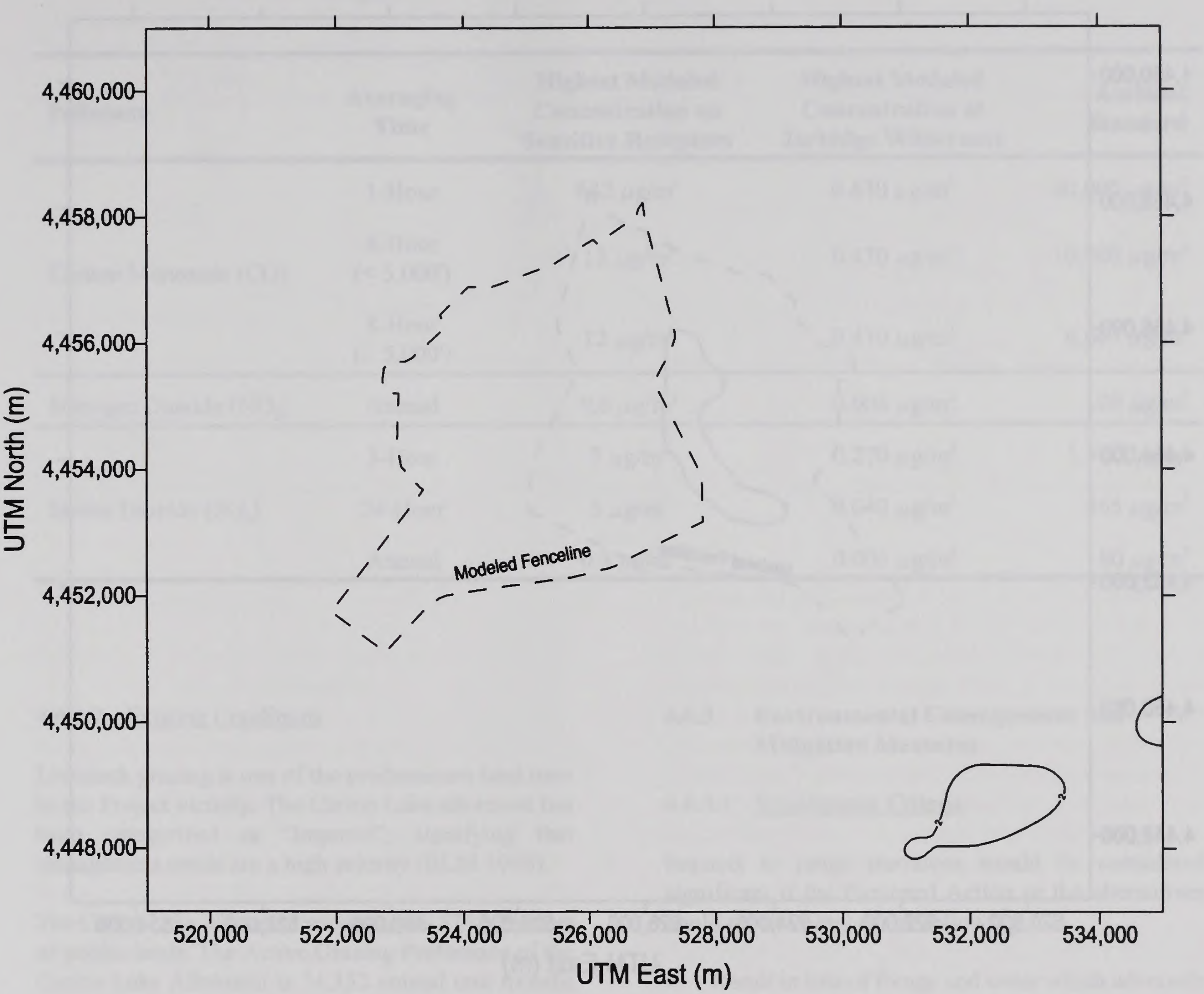
Ambient 24-Hour SO2 Standard is 365 ug/m3

File: so224h_91.dwg
Date: 11/18/98
Reviewed By: DNW
Revised by: CLM

Isopleth of the Modeled Highest 24-Hour SO2 Concentrations in Micrograms Per Cubic Meter (ug/m3)

Figure 4.5.8

SOUTH PIPELINE PROJECT EIS



EXPLANATION

— — — Modeled Fenceline

Isopleths Displayed for 2 ug/m3

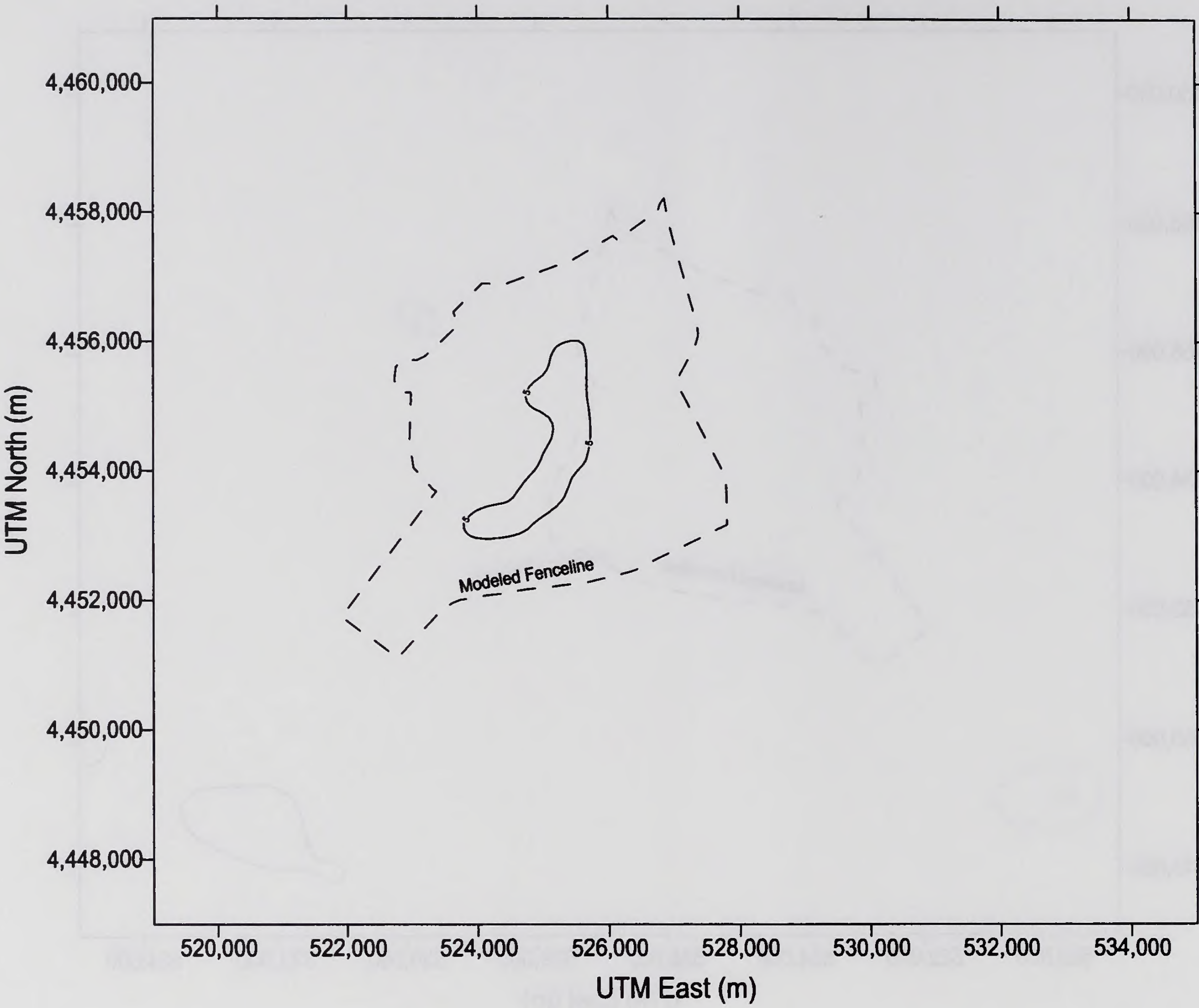
Ambient Annual SO2 Standard is 80 ug/m3

File: so2an91.dwg
Date: 11/18/98
Reviewed By: DNW
Revised by: CLM

Isopleth of the Modeled Highest Annual SO2 Concentrations in Micrograms Per Cubic Meter (ug/m3)

Figure 4.5.9

SOUTH PIPELINE PROJECT EIS



EXPLANATION

— — — Modeled Fenceline

Isopleths Displayed for 5 ug/m3 Countour Interval

Ambient Annual NO2 Standard is 100 ug/m3

File: noxan_91.dwg
Date: 11/18/98
Reviewed By: DNW
Revised by: CLM

Isopleth of the Modeled Highest Annual NO2 Concentrations in Micrograms Per Cubic Meter (ug/m3)

Figure 4.5.10

SOUTH PIPELINE PROJECT EIS

Table 4.5.6: List of the Highest CO, NO_2, And SO_2 Impacts from the Proposed Action on the Defined Sensitive Receptors

Pollutant	Averaging Time	Highest Modeled Concentration on Sensitive Receptors	Highest Modeled Concentration at Jarbidge Wilderness	Ambient Standard
Carbon Monoxide (CO)	1-Hour	642 $\mu g/m^3$	0.630 $\mu g/m^3$	40,000 $\mu g/m^3$
	8-Hour (< 5,000')	12 $\mu g/m^3$	0.470 $\mu g/m^3$	10,000 $\mu g/m^3$
	8-Hour (≥ 5,000')	12 $\mu g/m^3$	0.470 $\mu g/m^3$	6,667 $\mu g/m^3$
Nitrogen Dioxide (NO_2)	Annual	0.8 $\mu g/m^3$	0.008 $\mu g/m^3$	100 $\mu g/m^3$
Sulfur Dioxide (SO_2)	3-Hour	7 $\mu g/m^3$	0.270 $\mu g/m^3$	1,300 $\mu g/m^3$
	24-Hour	3 $\mu g/m^3$	0.040 $\mu g/m^3$	365 $\mu g/m^3$
	Annual	0.3 $\mu g/m^3$	0.003 $\mu g/m^3$	80 $\mu g/m^3$

4.6.2.2 Existing Conditions

Livestock grazing is one of the predominant land uses in the Project vicinity. The Carico Lake allotment has been categorized as "Improve", signifying that management needs are a high priority (BLM 1988).

The Carico Lake Allotment encompasses 574,129 acres of public lands. The Active Grazing Preference of the Carico Lake Allotment is 34,352 animal unit months (AUMs) (BLM 1987). The grazing capacity within the Project Area is projected to be 1,437 AUMs, or approximately four percent of the Active Grazing Preference for the allotment. The calculation uses an average range condition allotment-wide of 17 acres/AUM applied to undisturbed acres within the Project Area boundary (Personal Communication - Mike Neff, Resource Specialist, BLM, Battle Mountain, Nevada; August 26, 1997).

Table 4.6.1 lists current grazing use data by operator. Approved operators in the vicinity of the Project Area are the Dean Ranch and C Ranches, Inc.

4.6.3 Environmental Consequences and Mitigation Measures

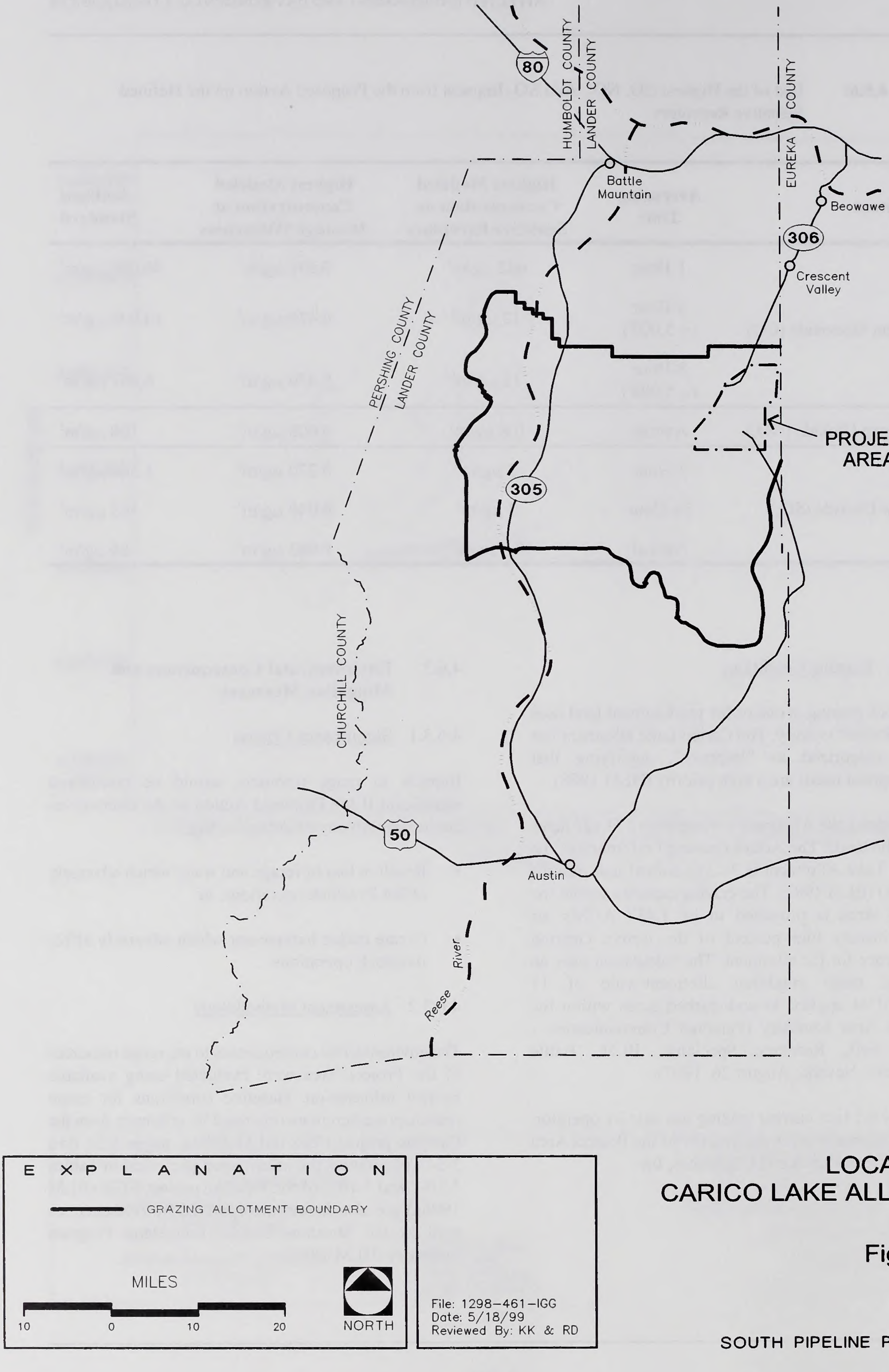
4.6.3.1 Significance Criteria

Impacts to range resources would be considered significant if the Proposed Action or the alternatives could result in any of the following:

- Result in loss of forage and water which adversely affect livestock operations; or
- Create undue harassment which adversely affect livestock operations.

4.6.3.2 Assessment Methodology

The environmental consequences to the range resources of the Project Area were evaluated using available Project information. Baseline conditions for range resources are herein incorporated by reference from the Pipeline project FEIS (BLM 1996a; pages 3-52 thru 3-54). In addition, the information presented in Tables 3.10-1 and 3.10-2 of the Pipeline project FEIS (BLM 1996a) are also herein incorporated by reference, as well as the Shoshone-Eureka Rangeland Program Summary (BLM 1988).



LOCATION OF
CARICO LAKE ALLOTMENT

Figure 4.6.1

SOUTH PIPELINE PROJECT EIS

Table 4.6.1: 1997 Approved Grazing Use in the Carico Lake Allotment

Operator	Livestock	Grazing Period	Percent Public Land	AUM
Agri-Beef	Sheep	04/01 to 06/30 10/01 to 11/30	100 100	299 101
C Ranches, Inc.	Cattle	Year-round	100	13,405
Dean Ranch	Cattle	11/01 to 03/31	100	3,420
Ellison Ranching Co.	Sheep	11/01 to 04/30	100	2,186
Filippini Ranching, Co.	Cattle	Year-round	97	12,276
Julian Tomera Ranches, Inc.	Sheep	03/01 to 05/31	100	1,240
Silver Creek Ranch, Inc.	Sheep	Year-round	100	1,200

4.6.3.3 Proposed Action

4.6.3.3.1 Environmental Consequences and Mitigation Measures

During mine development, a perimeter fence would be constructed in the general area which includes the open pit(s) and safety berm and setback area, ore and solution process area, tailings facilities, heap leach pad, and solution overflow ponds and ancillary facilities. Waste rock stockpiles would not be fenced. The construction of this fence would exclude livestock grazing during mine operation and reclamation.

Mine development and operation would result in the temporary loss of AUMs. A total of 352 AUMs would be temporarily lost during mine operation which would reduce the Active Grazing Preference within the Carico Lake Allotment to 33,775 AUMs; the current Active Grazing Preference is 33,860 AUMs for the entire allotment. The temporary loss of 352 AUMs within the grazing allotment represents 1 percent of the Active Grazing Preference. The Partial Backfill, Injection, and Water Delivery to Private Land options do not otherwise impact range resources.

▣ **Impact 4.6.3.3.1-1:** Mine development and operation would result in the temporary loss of 352 AUMs.

Significance of the Impact: This impact is considered less than significant and no mitigation measures are required.

The majority of disturbed lands within the Project Area would be reclaimed (Section 3.7 Reclamation Plan), of which 3,845 acres would be available for future grazing. Successful revegetation of disturbed lands would increase plant cover and provide an adequate amount of forage to recover the majority of AUMs lost during mine development. Livestock grazing may be resumed after re-established vegetation is capable of supporting grazing (i.e., once re-established vegetation has met BLM/NDEP standards, whatever the time period).

The current Active Grazing Preference would be permanently reduced by 36 AUMs to 33,824 AUMs. The permanent loss of 36 AUMs would not be considered a significant adverse impact since the loss represents 0.1 percent of the active grazing preference.

Reduction in the available range on the allotment is not expected to cause degradation of the vegetation resources since the current use of the area is already below permit limits (existing actual use 27,171 AUMs). The reduced number of AUMs would be considered in any formal allotment evaluation process.

▣ **Impact 4.6.3.3.1-2:** Mine development and operation would result in the permanent loss of 36 AUMs.

Significance of the Impact: This impact is considered less than significant and no mitigation measures are required.

No impacts to existing range improvements are anticipated since all current improvements lie outside the area of direct impact.

4.6.3.3.2 Residual Adverse Impacts

Residual impacts for range resources would include the temporary loss of approximately 352 AUMs and permanent loss of 36 animal unit months.

4.6.3.4 Pipeline Backfill Alternative

4.6.3.4.1 Environmental Consequences and Mitigation Measures

Mine development and operation would result in the temporary loss of AUMs. A total of 304 AUMs would be temporarily lost during mine operation which would reduce the current Active Grazing Preference within the Carico Lake Allotment to 33,556 AUMs; the current Active Grazing Preference is 33,860 AUMs for the entire allotment. The temporary loss of 304 AUMs within the grazing allotment represents less than 1 percent of the Active Grazing Preference.

▣ **Impact 4.6.3.4.1-1:** Mine development and operation would result in the temporary loss of 304 AUMs.

Significance of the Impact: This impact is considered less than significant and no mitigation measures are required.

The majority of disturbed lands within the Project Area would be reclaimed (Section 3.7 Reclamation Plan) and would be available for future grazing. Successful revegetation of disturbed lands would increase plant cover and provide an adequate amount of forage to recover the majority of AUMs lost during mine development. Livestock grazing may be resumed after re-established vegetation is capable of supporting grazing (i.e., once re-established vegetation has met BLM/NDEP standards).

The Active Grazing Preference would be permanently reduced by 20 AUMs to 33,840 AUMs. The permanent loss of 20 AUMs would not be considered a significant adverse impact since the loss represents less than 0.1 percent of the Active Grazing Preference.

Reduction in the available range on the allotment is not expected to cause degradation of the vegetation resources since the current use of the area is already below permit limits (existing actual use 27,171 AUMs). The reduced number of AUMs would be considered in any formal allotment evaluation process.

▣ **Impact 4.6.3.4.1-2:** Mine development and operation would result in the permanent loss of 20 AUMs.

Significance of the Impact: This impact is considered less than significant and no mitigation measures are required.

4.6.3.4.2 Residual Adverse Impacts

Residual impacts for range resources would include the temporary loss of approximately 304 AUMs and permanent loss of 20 animal unit months.

4.6.3.5 No Action Alternative

4.6.3.5.1 Environmental Consequences and Mitigation Measures

Loss of AUMs associated with the Proposed Action would not occur with the No Action Alternative. Range impacts would be limited to ongoing, permitted mining and exploration activities.

4.6.3.5.2 Residual Adverse Impacts

There would be no residual impacts to range resources under the No Action Alternative except those previously evaluated in the Pipeline project FEIS (BLM 1996a).

4.7 Noxious Weeds

The BLM defines "noxious weed" as "a plant that interferes with management objectives for a given area of land at a given point in time" (BLM 1996b). The State of Nevada defines "noxious weeds" as "any species of plant which is, or liable to be, detrimental or destructive and difficult to control or eradicate..." (NRS 555.005). The BLM Nevada strategy for noxious weed management is to "prevent and control the spread of noxious weeds through local and regional cooperative efforts ... to ensure maintenance and restoration of healthy ecosystems on BLM-managed lands. Noxious weed control will be based on ... prevention, education, detection, and quick control of small infestations" (BLM 1997). The BLM-NSO maintains a "Nevada Noxious Weed List".

4.7.1 Regulatory Framework

4.7.1.1 Carson-Foley Act (1968)

The Carson-Foley Act of 1968 directs the BLM to "take any action necessary to prevent unnecessary and or undue degradation of the public lands."

4.7.1.2 Federal Noxious Weed Act

The Federal Noxious Weed Act (1974), as amended by Section 15 of the Management of Undesirable Plants on Federal Lands (1990), authorizes the Secretary of the Interior "to cooperate with other federal and state agencies and others in carrying out operations or measures to eradicate, suppress, control, prevent, or retard the spread of any noxious weed." The act contains directives for establishing a noxious weed management program. The act also provides the authority for including noxious weeds as one of the mandatory items in BLM's National Environmental Policy Act Handbook, H-1790-1, effectively requiring the consideration of noxious weeds and the appropriate measures to prevent or mitigate their impacts in the EIS.

4.7.1.3 U.S. Interior Departmental Manual 609

Departmental Manual 609 prescribes policy to control undesirable or noxious weeds on the lands, waters, or facilities under its jurisdiction to the extent economically practicable, and as needed for resource protection and accomplishment of resource management objectives.

4.7.1.4 BLM Manual 9011 and Handbook H-9011-1; BLM Manual 9014; and BLM Manual 9015

BLM Manual 9011 and Handbook H-9011-1 provides policy for conducting chemical pest control programs under an integrated pest management approach. BLM Manual 9014 provides guidance and procedures for planning and implementing biological control in integrated pest management programs. Finally, BLM Manual 9015 provides policy relating to the management and coordination of noxious weed activities among the BLM, organizations, and individuals. The policy requires that all ground-disturbing projects and any projects that alter plant communities be assessed to determine the risk of introducing or spreading noxious weeds. If the risk is moderate or higher, a positive management program needs to be established.

4.7.1.5 BLM Battle Mountain Field Office Cooperative Agreements

Currently the BLM's Battle Mountain Field Office is entering into cooperative weed management agreements with multiple participants from Eureka, Lander, and Nye counties. Participants of the different partnerships include the Nevada Division of Wildlife, U.S. Forest Service, Nevada Division of Agriculture, county governments, local extension services, Nevada Dept. of Transportation, private landowners, Natural Resources Conservation Service, and others. The purpose of the cooperative agreements is to establish terms and conditions under which noxious weed management teams will cooperate and coordinate activities necessary to manage noxious weeds.

4.7.1.6 Nevada Revised Statutes and Administrative Code

Chapter 555 of the Nevada Revised Statutes (NRS) and the Nevada Administrative Code (NAC) addresses designation of and control of noxious weeds and their removal from the public domain.

4.7.2 Affected Environment

4.7.2.1 Study Methods

A noxious weed monitoring and control plan was prepared as part of the Pipeline Plan of Operations (JBR Environmental Consultants, Inc. 1998b). The noxious weed assessment is primarily based on the information in the monitoring and control plan.

4.7.2.2 Existing Conditions

Infestations of hoary cress or whitetop (*Cardaria draba*) and saltcedar or tamarisk (*Tamarix* sp.) are present within the Project Area based on reports from CGM personnel. In addition, the monitoring and control plan identifies five other species that have growth requirements that are suited to the soils, annual precipitation, or disturbed condition within the Project Area (Table 4.7.1). No formal weed inventory has been conducted to date.

4.7.3 Environmental Consequences and Mitigation Measures

Weed species rapidly invade disturbed areas and initially hinder the establishment of more desirable perennial grasses and forbs by out competing them for moisture during the initial years following disturbance or seeding. Noxious weeds are typically very aggressive and have the ability to dominate sites with dramatic impacts to native plant communities, as well as decreasing the available amount of forage for livestock and wildlife.

4.7.3.1 Significance Criteria

Based upon BLM Manual 9015 guidelines, a project would be considered to have a significant affect on noxious weed management if it resulted in the following:

Table 4.7.1: Noxious Weed Species that Occur or have the Potential to Occur within the Project Area

Species	Habitat
Hoary cress or whitetop (*Cardaria draba*)	Disturbed sites with alkaline soils.
Saltcedar or tamarisk (*Tamarix ramosissima*)	Normally along waterways in alkaline soils and saline meadows that are seasonally saturated or experience seasonal high water tables.
Spotted knapweed (*Centaurea maculosa*)	Roadsides, cultivated fields, and rangelands that receive less than 8 inches of annual precipitation.
Diffuse knapweed (*Centaurea diffusa*)	Roadsides, waste areas, dry rangelands, and disturbed sites. It may dominate rangelands which receive less than 15 inches of annual precipitation.
Yellow starthistle (*Centaurea solstitialis*)	Variety of sites. Rangelands with annual precipitation less than 15 inches.
Scotch thistle (*Onopordum acanthium*)	Roadsides, fence rows, ditch banks, in waste areas and pastures.
Leafy spurge (*Euphorbia esula*)	Coarse soils under good moisture conditions with little competition.

Source: (JBR 1998b)

- An increased likelihood of noxious weed species being introduced into a relatively weed-free area at moderate or high-ecological risk; or
- An expansion of noxious weed infestation(s) within and outside of the Project Area into relatively weed-free areas at moderate or high-ecological risk.

'Ecological risk' is the level of likelihood and consequence of adverse effects on the environment. A determination of a Risk Rating ('none', 'low', 'moderate', or 'high') is made through the Risk Assessment process outlined in Appendix 1 of BLM Manual 9015. Areas with a moderate or high risk rating have: (a) noxious weed infestations immediately adjacent to or within the Project Area; (b) activities associated with the Project that are likely to result in some areas becoming infested; and (c) there are probable adverse effects on native plant communities within, and possibly outside of, the Project Area.

4.7.3.2 Assessment Methodology

The assessment of the effects of the Project on noxious weed management is based on the results of the risk assessment in the monitoring and control plan (JBR 1998b). The effects are determined to be significant or not significant based on the applicable significance criteria listed in Section 4.7.3.1.

4.7.3.3 Proposed Action

4.7.3.3.1 Environmental Consequences and Mitigation Measures

The Proposed Action may indirectly cause the introduction or spread of noxious weeds into disturbed areas. Common methods of introduction and spread include the movement of contaminated equipment across uncontaminated lands, and spreading gravel, roadfill, and topsoil contaminated with noxious weed seed in areas that were previously weed-free (BLM 1996b). Moisture available from watering of roads and other traffic areas for dust suppression during construction and mining activities could result in a temporary increase in some opportunistic plant species

immediately adjacent to active roadways or other watered surface areas. Similarly, areas conducive to supporting noxious weeds may be created in other moist areas, such as new low spots or drainage areas where water could pond within the active portions of the Project Mine and Process Area, infiltration basins, and seasonally moist areas within the remnant pit.

The Proposed Action will result in an additional 3,845 acres of disturbance that could support vegetation over and above the currently approved mining-related activities. The total does not include the area in the vicinity of the open pit (605 acres) because in general it will not support vegetation. However, there may be relatively small, seasonally moist areas within the remnant pit that could support weed species. The Water Delivery to Private Land Option does not otherwise impact noxious weeds. The Partial Backfill and Injection options would disturb less area, therefore, there would be a proportionally less opportunity for noxious weed invasion.

▣ **Impact 4.7.3.3.1-1:** The salvaging and stockpiling of soil, and the subsequent use of the soil for reclamation, could result in a possible expansion of whitetop within the Project Area. Other disturbed surfaces would be suitable for whitetop establishment.

Significance of the Impact: This impact is considered potentially significant. The following mitigation measures are provided which would reduce the adverse effects of the impact to below the level of significance.

- **Mitigation Measure 4.7.3.3.1-1:** The control measures targeted at minimizing the establishment of whitetop on the soil stockpiles and other disturbed sites as stated within the noxious weed monitoring and control plan would be applied. Reclaimed areas would be monitored annually until the reclamation bond was released.

▣ **Impact 4.7.3.3.1-2:** The percolation of water into the alluvium creates local, near surface soil water moisture conditions conducive to saltcedar establishment and spread. Due to increased ponded water and local areas of surface saturation, and traffic on an off the Project Area, saltcedar could expand to areas outside the Project Area. Adverse effects to native plant communities would probably occur.

Significance of the Impact: This impact is considered potentially significant. The following mitigation measures are provided which would reduce the adverse effects of the impact to below the level of significance.

- **Mitigation Measure 4.7.3.3.1-2:** The control measures targeted at controlling the establishment of saltcedar as stated within the noxious weed monitoring and control plan would be applied. A monitoring program would be conducted for at least five years.

▣ **Impact 4.7.3.3.1-3:** Noxious weeds may be introduced to the Project Area as an indirect result of mining construction and operation. Surface disturbance creates an environment conducive to supporting weed species. The use of construction equipment from outside areas provides a transport means for noxious weed seed into and throughout the Project Area.

Significance of the Impact: This impact is considered potentially significant. The following mitigation measures are provided which would reduce the adverse effects of the impact to below the level of significance.

- **Mitigation Measure 4.7.3.3.1-3:** The monitoring measures as stated in the noxious weed monitoring and control plan would be applied. The presence of all weed species shall be recorded, and new infestations managed appropriately.

4.7.3.3.2 Residual Adverse Impacts

The Proposed Action would result in the unavoidable disturbance of approximately 3,845 acres of vegetation which would produce habitat conducive to supporting noxious weeds. Implementation of reclamation and the noxious weed monitoring and control plan would reduce or eliminate the chance of noxious weed establishment and infestation.

4.7.3.4 Pipeline Backfill Alternative

Impacts to noxious weed management from the Pipeline Backfill Alternative are generally the same as those described for the Proposed Action. The differences between the Proposed Action and the Pipeline Backfill Alternative that relate to impacts on noxious weed management are that the alternative would result in less (609 acres) surface disturbance in the area of the South Pipeline waste rock dump than the Proposed Action, and the Pipeline open pit would be reclaimed following backfilling (276 acres).

4.7.3.4.1 Environmental Consequences and Mitigation Measures

The Pipeline Backfill Alternative would result in an additional 3,236 acres of disturbance that could support vegetation over and above the currently approved mining-related activities. The total does not include the area in the vicinity of the open pit (605 acres) because in general it will not support vegetation. However, there could be relatively small, seasonally moist areas within the remnant pit that could support weed species. Backfilling of the Pipeline open pit would eliminate similar moist areas, however there would be an additional 276 acres of disturbed soil that could provide habitat conducive to supporting noxious weeds. The impact and mitigation measures for this alternative are the same as for the Proposed Action (Section 4.7.3.3.1) and are incorporated by reference.

4.7.3.4.2 Residual Adverse Impacts

The Pipeline Backfill Alternative would result in the unavoidable disturbance of approximately 3,841 acres of vegetation which would produce habitat conducive to supporting noxious weeds. Implementation of reclamation and the noxious weed monitoring and control plan would reduce or eliminate the chance of noxious weed establishment and infestation.

4.7.3.5 <u>No Action Alternative</u>

Under the No Action Alternative, CGM is currently authorized to disturb 3,166 acres of vegetation as a result of the construction and operation of the Pipeline project. Vegetation within the 4,450 acres of proposed surface disturbance associated with the Proposed Action would remain undisturbed, and therefore would not favor the establishment of noxious weeds.

4.7.3.5.1 Environmental Consequences and Mitigation Measures

The No Action Alternative would result in 3,166 acres of disturbance that would create habitat conducive to supporting noxious weeds. The impact from this alternative is the same as for the Proposed Action (Section 4.7.3.3.1) and is incorporated by reference. The impact would be mitigated by the noxious weed monitoring and control program that is administered under the Pipeline project.

4.7.3.5.2 Residual Adverse Impacts

The No Action Alternative would result in the unavoidable disturbance of approximately 3,166 acres of vegetation which would produce habitat conducive to supporting noxious weeds. Implementation of reclamation and the noxious weed monitoring and control plan would reduce or eliminate the chance of noxious weed establishment and infestation.

4.8 <u>Vegetation Resources</u>

4.8.1 Regulatory Framework

This section discusses the laws, regulations, guidelines, and procedures applicable to management of the vegetation resources affected by the Project.

4.8.1.1 <u>Endangered Species Act</u>

The Federal Endangered Species Act of 1973, as amended (ESA), safeguards the continued existence of any species classified as "endangered" or "threatened", as well as habitat which is determined by the Secretary of the Interior to be critical to such species. It is administered by the U.S. Fish and Wildlife Service (USFWS), in consultation with other federal and state agencies. The ESA defines the following terms:

- <u>Endangered species</u>: "... any species which is in danger of extinction throughout all or a significant portion of its range..."
- <u>Threatened species</u>: "... any species which is likely to become an endangered species within the foreseeable future..."
- <u>Critical habitat</u>: "... the specific areas within the geographical area occupied by the species... on which are found those physical or biological features (I) essential to the conservation of the species and (II) which may require special management considerations or protection..."

The ESA prohibits the "take" (i.e., killing, harming, or harassment) of listed T/E species without special exemptions. Protection under the ESA also extends to species and habitat proposed for listing (Proposed) and Candidate species. Candidate species are species for which sufficient information on the vulnerability and threats to the species exists to warrant listing as Threatened or Endangered. Analogous to the ESA, Nevada State law (Nevada Revised Statute (NRS) 527.270-.300) prohibits removal or destruction of species listed as "threatened with extinction" except by special permit from the Nevada Division of Forestry (NDF).

In addition to listed T/E and Candidate species, the USFWS identifies another group of species known as Species of Concern (formerly Candidate, Category 2

species). Species of Concern are not specifically afforded the same protection under the ESA as T/E species, but federal agencies are required to afford them consideration in their planning and decision-making processes. The BLM evaluates Species of Concern in a manner analogous to T/E species. On May 1, 1996, the Nevada State Office (NSO) incorporated all former USFWS-designated Category 2 candidate species into the Nevada Special Status Species List and classified them as Sensitive. Sensitive species are protected by BLM policy which requires that actions authorized, funded, or carried out by the agency do not contribute to the listing of any Candidate or Sensitive species as Threatened or Endangered under the ESA.

4.8.1.2 Executive Order 11990 - Protection of Wetlands

Executive Order 11990: Protection of Wetlands (1977) (Order) is an overall wetlands policy for all agencies managing federal lands, sponsoring federal projects, or providing federal funds to state or local projects. The Order requires federal agencies to follow avoidance/mitigation/preservation procedures with public input, before proposing new construction in wetlands. When federal lands are proposed for lease to non-federal parties, the Order requires that restrictions be placed in the lease to protect and enhance the wetlands on the property.

4.8.1.3 BLM Riparian-Wetland Initiative

The Riparian-Wetland Initiative for the 1990s (Initiative) provides an overall national strategy for management and restoration of riparian-wetland areas on BLM lands. The objective of riparian area management is to "maintain, restore, or improve riparian values to achieve a healthy and productive ecological condition for maximum long-term benefits." One of the associated goals of the Initiative is to "restore and maintain riparian-wetland areas so that 75 percent or more are in proper functioning condition by 1997." One of the implementation strategies to achieve the goals of the Initiative is stated as the following: "Protection/Mitigation: Avoid or mitigate the impact of surface disturbance activities on riparian-wetland areas."

4.8.1.4 Nevada Natural Heritage Program

The Nevada Natural Heritage Program (NNHP) maintains a computerized inventory of information on the general location and status of Nevada's sensitive plants and natural biological communities. The NNHP tracks state and federally protected species as well as species that the scientific community considers deserving of official listing. The information is derived from reported sightings only, and does not cover every project location. Therefore, site-specific biological surveys are also required by the lead agencies to meet NEPA requirements for most projects.

4.8.1.5 Northern Nevada Native Plant Society

The Northern Nevada Native Plant Society (NNNPS) is a non-profit organization which functions in an advisory capacity to state and federal agencies regarding Nevada native plants and their distributions. The NNNPS has created six categorical designations of plants to identify their respective concern for these species. The designations do not afford legal status or protection for the species, but the lists produced by NNNPS are utilized by agencies in their planning processes for activities which may impact the species or habitat. The listing categories include the following:

- Endangered: Believed to meet the ESA definition of Endangered.
- Threatened: Believed to meet the ESA definition of Threatened.
- Watch-List: Potentially vulnerable to becoming Threatened or Endangered.
- Possibly Extirpated: Historically native to Nevada, but may no longer survive in the wild.
- Absent: Currently and historically absent from Nevada, listed in the past but not now of concern.
- Delisted: Dropped from consideration, no longer of concern to NNNPS.

4.8.2 Affected Environment

The Project Area is physiographically described as being located within the Central Great Basin section of the Great Basin floristic division, Intermountain Region. The Central Great Basin section is characterized by isolated mountain ranges trending north and south separated by extensive intermontane basins. In general the Great Basin is an area of low rainfall, a cold desert. The three main plant communities that blanket the valleys and lower slopes of the mountains are shadscale (*Atriplex confertifolia*), sagebrush (*Artemisia tridentata*), and piñon-juniper (*Pinus monophylla, Pinus edulis,* and *Juniperus osteosperma*) (Cronquist et al. 1972).

4.8.2.1 Study Methods

The following discussion on vegetation communities in the Project Area is based upon information presented in the Pipeline project FEIS (BLM 1996a; pages 3-30 through 3-34). Information on Special Status Species was obtained from a report prepared by JBR (1996c). In addition, information was requested from the NNHP and the USFWS on known occurrences of Special Status Species or habitat for such species within the Project Area. Finally, files maintained by the Elko and Battle Mountain field offices of the BLM were searched for records of Special Status Species occurrences during preparation of the Pipeline project FEIS (BLM 1996a; page 3-34).

4.8.2.2 Existing Conditions

4.8.2.2.1 Vegetation Communities

A vegetation or plant community is a repeatable association of dominant and subordinate plants that are found consistently growing together in similar habitat. The Project Area is comprised of three upland plant communities - the shadscale/budsage community, the sagebrush/grass community, and the shadscale/black greasewood community (Figure 4.8.1). Each of the communities are described in the Pipeline project FEIS which is herein incorporated by reference (BLM 1996a; page 3-33 and Table 3.5-5, page 3-103). The dominant plant community within the Project Area is the shadscale/budsage community. Big sagebrush inclusions are sparsely scattered within the shadscale/budsage community. A transition from the shadscale/budsage community to the sagebrush grass community occurs on the western boundary of the Project Area. There are no wetlands, riparian areas, or forested lands within the Project Area.

4.8.2.2.2 Special Status Species

Special Status Species include species which are protected by the ESA or NRS 527.270-.300, and species which are designated as Sensitive by the BLM. No state or federally Threatened, Endangered, or Candidate species are currently known to exist within the Project Area. Two plant species designated as Sensitive by the BLM, Eastwood's milkweed and Elko rockcress, have the potential to occur within the Project Area based on their distribution and habitat requirements (Table 4.8.1). To date, there are no documented occurrences of either of the two species within the Project Area.

4.8.3 Environmental Consequences and Mitigation Measures

The environmental consequences of the Proposed Action and each alternative as they relate to vegetation resources are discussed in this section.

4.8.3.1 Significance Criteria

Based upon NEPA guidelines and commonly accepted criteria, a project would normally be considered to have a significant effect on vegetation resources if the following occurred:

- Substantially affect a species or habitat afforded protection under either the ESA or state law; or designated as having special status (Species of Concern, Sensitive Species, etc.) by an overseeing agency; or

- Eliminate a natural plant community from the Project Area.

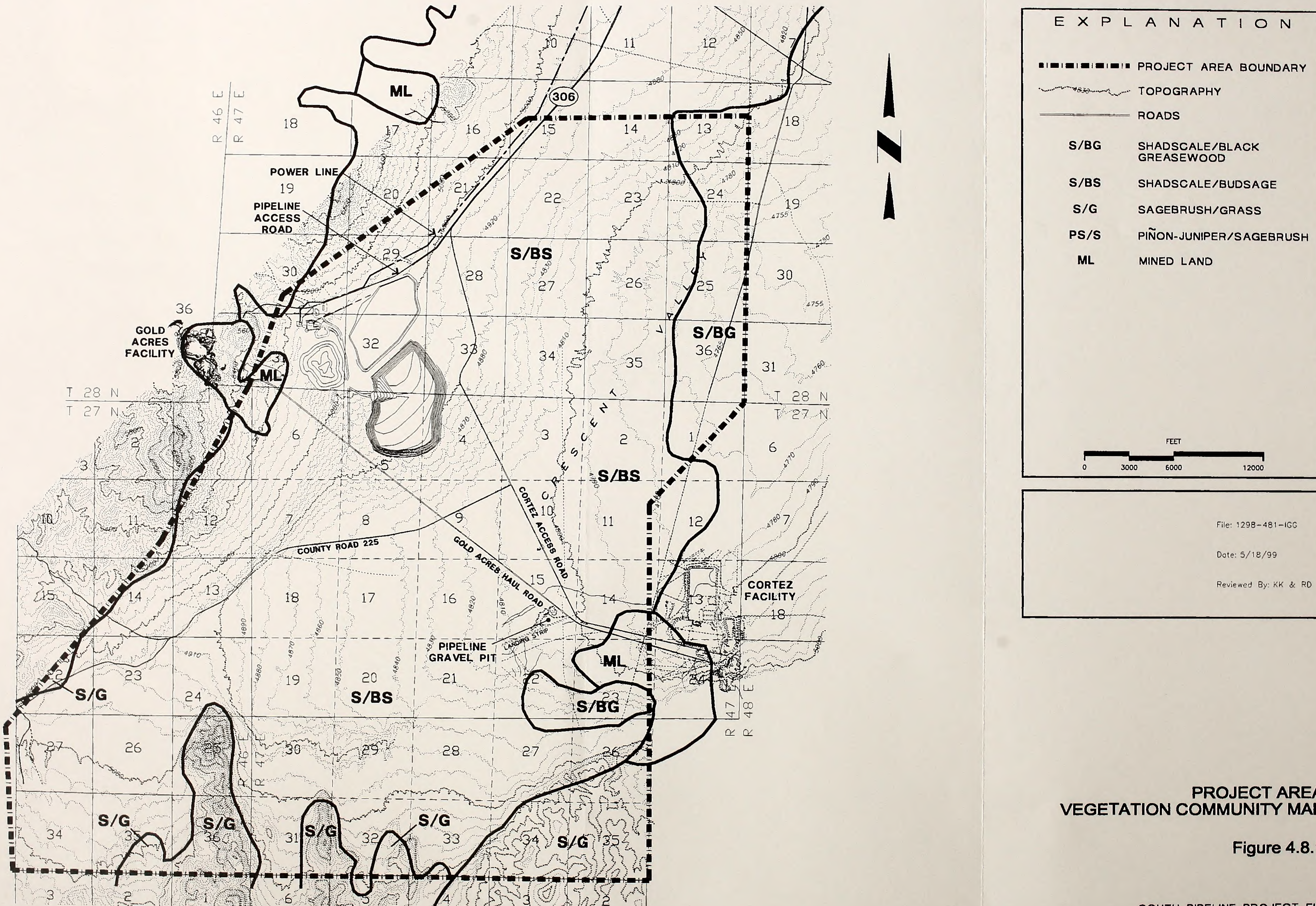
Violation of the Executive Order 11990 - Protection of Wetlands would also be considered a significant impact. Effects that are inconsistent with the objectives set forth in the BLM Riparian Initiative are also considered significant.

The degree of significance of the effect is directly related to the dependence of individuals of a plant species on the habitats present within the proposed area of operations, and how these habitats are altered by the construction and operation of the Project. 'Dependence' on habitat is evaluated by determining the amount of habitat affected, and what proportion it is of the amount of habitat available within the Project Area.

4.8.3.2 Assessment Methodology

Potential effects on vegetation resources can be categorized as direct and indirect, as well as short-term (i.e., during the life of the Project) and long-term. Direct impacts are those which would result in the removal of vegetation due to surface disturbance. Indirect impacts include the degradation of vegetation due to trampling, soil compaction, spills, etc. Short-term loss of vegetation would occur in areas subject to surface disturbance and subsequent reclamation. Long-term loss of vegetation would occur in areas that would not be revegetated (i.e., pits that are not backfilled).

The assessment of the effects of the Project on vegetation resources is based on the information on vegetation composition contained in the Pipeline



PROJECT AREA VEGETATION COMMUNITY MAP

Figure 4.8.1

Table 4.8.1: Special Status Plant Species that have the Potential to Occur within the Project Area

Species	BLM Status	NNNPS Status	Habitat Preference
Eastwood's milkweed (*Asclepias eastwoodiana*)	Sensitive	Watch	Low alkaline clay hills or shallow, gravelly drainages. In association with shadscale, budsage, greasewood, and horsebrush. Elevations between 5,300 and 6,900 feet.
Elko rockcress (*Arabis falcifructa*)	Sensitive	Watch	Moderate to steep north-facing slopes in light sandy ash soils, in sagebrush/rabbitbrush/bluegrass community. Elevations between 5,300 and 6,100 feet.

project FEIS (BLM 1996a; pages 3-30 through 3-34). The effects are determined to be significant or not significant based on the applicable significance criteria listed in Section 4.8.3.1.

4.8.3.3 Proposed Action

4.8.3.3.1 Environmental Consequences and Mitigation Measures

General Removal of Vegetation

Construction and operation of the Project would directly affect vegetation through removal in areas subject to surface disturbance. The locations of the proposed disturbance are identified on Figures 3.1.1 and 3.1.2, and the surface acreage by mine facility component is identified in Table 3.1.1. All of the surface disturbance resulting from the Proposed Action would be within the shadscale/budsage community or previously disturbed areas. The shadscale/budsage community is a common vegetation type in the vicinity of the Project. The Water Delivery to Private Land option does not otherwise impact the general removal of vegetation. The Partial Backfill and Injection options disturb less area, therefore, the impact of each option is proportionally less than the Proposed Action.

▣ **Impact 4.8.3.3.1-1:** Vegetation would be removed as a result of the construction and operation of the Project. The Proposed Action would result in an additional 4,450 acres of disturbance over and above the currently approved mining-related activities. The total is cumulative and would never be reached at any point in time since disturbance would be conducted incrementally and reclamation would begin upon completion of activities at each disturbed site. Reclamation would be completed for 3,845 acres or 86 percent of the disturbed area (Section 3.9). Approximately 605 acres of vegetation in the vicinity of the open pit would be removed and not reclaimed.

Significance of the Impact: This impact is considered less than significant and no mitigation measures are required.

Modification of Vegetation Structure

Vegetation removal and subsequent reclamation efforts would result in the conversion from a shrub-dominated community to a grass/forb-dominated community in the short-term. Once established, shrub species may become dominant within three to five years. However, it may take 15 to 20 years to establish mature shrubs. Although the structure of the vegetation would be modified, the reclaimed plant community is expected to produce adequate cover to stabilize the site and provide forage for use by livestock and wildlife in the short-term, thereby meeting the reclamation goals. The Partial Backfill, Injection, and Water Delivery to Private Land options do not otherwise impact the modification of vegetation structure.

▣ **Impact 4.8.3.3.1-2:** Vegetation removal and subsequent reclamation efforts would result in the conversion from a shrub-dominated community to a grass/forb-dominated community in the short-term. The removal of mature shrubs would be a long-term impact since it would take approximately 15 to 20 years after reclamation to re-establish mature shrubs in the Project Area.

Significance of the Impact: This impact is considered less than significant and no mitigation measures are required.

Water Table Drawdown

The mine dewatering system and subsequent refilling of the pit is expected to drawdown the ground water table in an area surrounding the open pit. As discussed in Section 4.4.3.3.1, modeling results show that significant water table drawdowns in the alluvial aquifer (in excess of 10 feet) would be limited to an area within approximately 5 miles from the site of the proposed pit at the end of mining. The 10-foot drawdown contour would extend as the pit fills 20 years after the end of mine dewatering to a maximum of 7 to 8 miles beyond the pit area (Geomega 1998a), Mine dewatering is not expected to affect flows in streams; nor any of the vegetation they support. Two springs approximately 1 mile east of the Project Area may be impacted by a drawdown of more than 10 feet. Mitigation Measure 4.4.3.3.1-2b is designed to reduce the post-mining impact to springs by restoring the historical yield of the spring. Therefore, impacts to vegetation supported by the springs, if they occur, would reduced to a level below significance.

Water table drawdown would have a negative effect on plants with root systems that tap into the water table (phreatophytes). As discussed in Section 4.4.2.2.3, in northern and central Nevada, the depth at which evapotranspiration by phreatophytes ceases is typically assumed to be approximately 20 feet. A conservative assumption is that all of the phreatophytes within the 10-foot drawdown contour will experience mortality. The area affected by the Proposed Action as it extends beyond the area affected by the Pipeline project is characterized by greasewood and approximately 2,000 acres in size. The affected area represents approximately six percent of the existing area of greasewood phreatophytes. Under the Water Delivery to Private Land Option, the 10-foot drawdown contour extends further than under the Proposed Action, therefore affecting a larger area of phreatophytes. Approximately 3,000 acres of phreatophyte vegetation would experience mortality, representing approximately nine percent of the existing area of greasewood phreatophytes. The Partial Backfill and Injection options do not otherwise impact phreatophytes. Conversely, phreatophytes may become temporarily established in the proximity of the infiltration sites due to higher water levels.

▣ **Impact 4.8.3.3.1-3:** Approximately 2,000 to 3,000 acres of phreatophyte vegetation would potentially experience mortality due to the water table drawdown associated with mine dewatering and subsequent filling of the open pit. The affected area represents approximately six to nine percent of the existing area of greasewood phreatophytes.

Significance of the Impact: This impact is considered less than significant and no mitigation measures are required.

Particulate Deposition on Vegetation

The Project mining activities and vehicular traffic would affect vegetation within the immediate vicinity of the Project Area by increasing the amount of airborne particulate deposition onto vegetation surfaces (see Section 4.5.3). Experiments currently underway in the California desert have demonstrated that the short-term effects of dusting may cause lowered primary production in desert plants due to reduced photosynthesis and decreased water-use efficiency. No long-term effects were detected in creosote bushes that were exposed to periodic acute heavy dust deposition along an unpaved road. Dusted creosote recovered its normal canopy by shedding dusted leaves and producing new shoots in response to seasonal rainfall (Personal Communication, S. Ahmann, U.S. Army National Training Center, June 6, 1997). The potential effects on vegetation from dust would be reduced by wind and periodic rain which would remove some of the accumulated dust. In addition, the implementation of the fugitive dust reduction measures contained in the Proposed Action would reduce the impact of deposition on vegetation. The Partial Backfill, Injection, and Water Delivery to Private Land options do not otherwise impact particulate deposition on vegetation.

▣ **Impact 4.8.3.3.1-4:** Vegetation in the immediate vicinity of Project Area could suffer periodic short-term reductions in primary production due to airborne particulate deposition onto exposed surfaces.

Significance of the Impact: This impact is considered less than significant and no mitigation measures are required.

Impacts to Special Status Species

There are no known occurrences of Special Status Species within the Project Area. Two Special Status Species have suitable habitat within the Project Area and may potentially occur there. There is potential for loss of habitat for these species as a result of the construction and operation of the Project. The Partial Backfill, Injection, and Water Delivery to Private Land options do not otherwise impact sensitive plant species.

▣ **Impact 4.8.3.3.1-5:** Suitable habitat may be lost for Eastwood's milkweed and Elko rockcress, both

BLM sensitive species, as a result of construction and operation of the Project.

Significance of the Impact: This impact is considered less than significant and no mitigation measures are required.

4.8.3.3.2 Residual Adverse Impacts

The Proposed Action would result in the unavoidable loss of up to 605 acres of vegetation resulting from surface disturbance in the open pit area. Approximately 3,845 acres of vegetation would be removed and reclaimed as a result of mine development, operation, and closure. The reclaimed plant community may have a modified structure in comparison with undisturbed vegetation due to the absence of mature shrubs for a period of 15 to 20 years. Approximately 2,000 to 3,000 acres of phreatophyte vegetation will potentially experience mortality as a result of water table drawdown and will not become re-established until the aquifer recovers to its original levels. The affected area represents approximately six to nine percent of the existing area of greasewood phreatophytes.

4.8.3.4 <u>Pipeline Backfill Alternative</u>

Impacts to vegetation from the Pipeline Backfill Alternative are generally the same as those described for the Proposed Action. The differences between the Proposed Action and the Pipeline Backfill Alternative that relate to impacts on vegetation are that the alternative would result in less (609 acres) surface disturbance in the area of the South Pipeline waste rock dump than the Proposed Action, and the Pipeline open pit would be reclaimed following backfilling (276 acres).

4.8.3.4.1 Environmental Consequences and Mitigation Measures

Impacts to vegetation from changes in structure, ground water drawdown, particulate deposition, and potential loss of habitat for special status species are the same as those described for the Proposed Action (Section 4.8.3.3.1) and are herein incorporated by reference.

<u>General Removal of Vegetation</u>

Construction and operation of the Project would directly affect vegetation through removal in areas subject to surface disturbance. The locations of the proposed disturbance are identified on Figures 3.1.1 and 3.1.2, and the surface acreage by mine facility component is identified in Table 3.1.1. All of the surface disturbance resulting from the Pipeline Backfill Alternative would be within the shadscale/budsage community or previously disturbed areas. The shadscale/budsage community is a common vegetation type in the vicinity of the Project.

▣ **Impact 4.8.3.4.1-1:** Vegetation would be removed as a result of the construction and operation of the Project. The Pipeline Backfill Alternative would result in an additional 3,841 acres of disturbance over and above the currently approved mining-related activities. The total is cumulative and would never be reached at any point in time since disturbance would be conducted incrementally and reclamation would begin upon completion of activities at each disturbed site. Reclamation would be completed for 3,238 acres or 84 percent of the disturbed area (Section 3.9). In addition, 276 acres of approved disturbance associated with the Pipeline project would be reclaimed following backfilling of the Pipeline open pit - an area that was not able to be reclaimed under the Proposed Action or as part of the Pipeline project. Approximately 605 acres of vegetation in the vicinity of the South Pipeline open pit would be removed and not reclaimed.

Significance of the Impact: This impact is considered less than significant and no mitigation measures are required.

4.8.3.4.2 Residual Adverse Impacts

The Pipeline Backfill Alternative would result in the unavoidable loss of up to 605 acres of vegetation resulting from surface disturbance in the open pit area. Approximately 3,238 acres of vegetation would be removed and reclaimed as a result of mine development, operation, and closure. The reclaimed plant community may have a modified structure in comparison with undisturbed vegetation due to the absence of mature shrubs for a period of 15 to 20 years. Approximately 2,000 to 3,000 acres of phreatophyte vegetation would potentially experience mortality as a result of water table drawdown and would not become re-established until the aquifer recovers to its original levels. The affected area represents approximately six to nine percent of the existing area of greasewood phreatophytes.

4.8.3.5 <u>No Action Alternative</u>

Under the No Action Alternative, CGM is currently authorized to disturb 3,166 acres of vegetation as a result of the construction and operation of the Pipeline project. Facilities and mining operations that have been

approved but not yet completed would have impacts on vegetation. Vegetation within the 4,450 acres of proposed surface disturbance associated with the Proposed Action would remain undisturbed.

4.8.3.5.1 Environmental Consequences and Mitigation Measures

The impacts on vegetation under the No Action Alternative would be the same as those described and analyzed in the Pipeline project FEIS (BLM 1996a; pages 4-40 through 4-42). Specifically, removal and reclamation of 2,850 acres of the shadscale/budsage community type; and permanent loss of 316 acres of vegetation in the area of the open pit.

4.8.3.5.2 Residual Adverse Impacts

The No Action Alternative would result in the unavoidable impacts on vegetation described in the Pipeline project FEIS (BLM 1996a; pages 4-41 and 4-67). Specifically, short-term loss of 2,850 acres of vegetation; permanent loss of 316 acres of vegetation in the area of the open pit; and the degree to which vegetation does not recover to a pre-disturbance condition over the long-term.

4.9 Wildlife and Fisheries Resources

This section discusses the laws, regulations, guidelines, and procedures applicable to management of the wildlife and fisheries resources potentially affected by the Project.

4.9.1 Regulatory Framework

4.9.1.1 BLM/NDOW Memorandum of Understanding (MOU)

Wildlife and fisheries resources and their habitat on public lands are managed cooperatively by BLM and NDOW under a Memorandum of Understanding (MOU) established in 1971. The MOU describes BLM's commitment to manage wildlife and fisheries resource habitat and NDOW's role in managing populations. BLM meets its obligations by managing public lands so that it protects and enhances food, shelter, and breeding areas for wild animals. NDOW assures healthy wildlife numbers through a variety of management tools including wildlife and fisheries stocking programs, hunting and fishing regulations, land purchases for wildlife management, cooperative enhancement projects, and other activities.

4.9.1.2 Protected Species

Species in need of additional management and protection, due to declining numbers or loss of habitat, are termed "special status species." These animals are protected under provisions of the Endangered Species Act (1973, as amended) or the Nevada BLM "sensitive" status (BLM Manual 6800 et seq.), as explained in Section 4.8.1. In addition, there is a Nevada State Protected Animal List (NAC 501.100 - 503.104) that BLM has incorporated, in part, into the sensitive list.

4.9.1.3 Migratory Bird Treaty Act

Provisions of the Migratory Bird Treaty Act (16 USC 701-718h) are applicable to birds within the proposed area of operations. The Act prohibits the killing of any migratory birds without a permit. Any activity, including well drilling, and associated activities, which contributes to unnatural migratory bird mortality could be prosecuted under the Act. With few exceptions most birds are considered migratory under the Act. Measures to prevent bird mortality must be incorporated into the project design.

4.9.1.4 Bald Eagle Protection Act

The Bald Eagle Protection Act (PL 92-535) provides federal protection to the bald eagle (*Haliaeetus leucocephalus*). Amendments to the Bald Eagle Protection Act provide additional federal protection to the golden eagle (*Aquila chrysaetos*). The act prohibits the direct or indirect take of an eagle, eagle part or product, or nest. The golden eagle is not listed under the ESA as a threatened or endangered species, however it is a protected species under the provisions of this act.

4.9.2 Affected Environment

The Project Area is a semi-enclosed basin with no wetlands, riparian areas, or forested lands. The dominant vegetation is shadscale/budsage.

4.9.2.1 Study Methods

The existing condition for wildlife resources was determined utilizing baseline data collected by the Nevada Division of Wildlife (NDOW) (NDOW 1997a; 1997b), JBR (JBR 1995a; 1995b; 1996; 1997a; 1997b; 1997c), resource data detailed in other sections of Chapter 4 of this document, and wildlife information contained in the Pipeline project FEIS (BLM 1996a; pages 3-34 to 3-41), which are herein incorporated by reference.

4.9.2.2 Existing Conditions

4.9.2.2.1 Wildlife

The following is a summary of relevant information from the above cited sources. General habitat types found throughout the Project Area are the same as those described in the Pipeline project FEIS (BLM 1996a; pages 3-30 through 3-33) and in Section 4.8 of this document. The focus of the discussion below is on those wildlife populations that could be affected by direct habitat modifications and by changes in the availability of water sources.

Big Game

Information provided by NDOW (1997a; 1997b), JBR (1997a), and CGM (Al Reuter, Personal Communication), confirms that Crescent Valley supports an expanding population of pronghorn antelope. NDOW transplanted pronghorn into the valley and they are now breeding. Biologists from NDOW have documented several sightings close to the Project Area. Biologists from JBR also noted pronghorn in the region in 1997. Employees of CGM have seen both adult and fawn pronghorn in the mesic vegetation in the areas of the infiltration sites during the past two years.

Mule deer occupy the mountainous portions of the Shoshone, Toiyabe, and Cortez ranges. They prefer elevations and vegetation above the valley floor. Wintering mule deer are primarily located at higher elevations, where water, shelter, and forage are more readily available.

Predators

NDOW reported that mountain lion populations exist in the mountainous portions of the Shoshone, Toiyabe, and Cortez ranges and that bobcats and badgers would also be expected in the area (NDOW 1997a; 1997b).

Upland Game

Sage grouse are common northwest of the Project Area. Chukar do not normally use the Project Area. Instead, they use steep, more rocky mountainous habitats in the northwestern portions of the Project Area away from the proposed disturbance. Blue grouse and Hungarian (gray) partridge may inhabit the upper slopes of Mount Tenabo (NDOW 1997a; 1997b).

Other Game

Other game bird species known to inhabit the Project Area include small numbers of mourning dove, California (valley) quail, and Wilson's snipe. All three bird species use valley floor and foothill habitats as foraging areas and fly to the infiltration sites and any nearby ponds or tanks to obtain water.

Cottontail rabbit and white-tailed jackrabbits also frequent the Project Area and are especially noticeable near infiltration sites. Pygmy rabbits may occupy a portion of the Project Area, however, this species has not been documented as having ever been observed within the Project Area.

Nongame Wildlife

A variety of nongame mammals occur in the area; furbearers include kit fox, gray fox, and coyote. Several species of mice, ground squirrels, and other rodents are also present in the Project Area.

Nongame avian species occurring in the Project Area include horned larks, sage thrashers, western meadowlarks, Brewer's and red-winged blackbirds, sage and Brewer's sparrows, several species of swallows, and possibly black-throated sparrows. Western grebes commonly nest at Ruby Lakes and may pass through the Project Area and CESA (described in the Pipeline project FEIS (BLM 1996a; pages 3-37). Migratory waterfowl and shorebirds are now present within the Project Area. It is likely that their presence is due to construction and operation of infiltration sites at the Pipeline project dewatering facility (NDOW 1997b).

Raptors

Many raptor species occur in the Crescent Valley area including year-round residents, wintering hawks, and spring nesting birds. No raptor nests of any species are known to exist within the Project Area. A lack of perch and nest sites limits raptor use of the Project Area.

4.9.2.2.2 Fisheries and Aquatic Resources

Indian Creek supports a naturally sustaining population of non-native brook trout (NDOW 1997a; 1997b). Frenchie and Duff Creeks, in the BLM's Elko Field Office, were found to support populations of brook and brown trout when these streams were sampled in the mid-1980s. Baseline surveys conducted during the preparation of the Pipeline project FEIS (BLM 1996a; pages 3-37 through 3-38) found most streams in a degraded condition, while mountain springs had been

adversely affected by both livestock and unauthorized wildhorses.

4.9.2.2.3 Special Status Species

No threatened, endangered, or candidate species are currently known to exist within the Project Area other than as transient species. NDOW, NNHP, and USFWS were requested to send information on known occurrences of special status species, or habitat for such species, within the Project Area. The agency data search yielded one documented occurrence of a state protected animal species (Western burrowing owl), potential occurrence of five other state protected animals (northern goshawk, ferruginous hawk, Swainson's hawk, golden eagle, and white-faced ibis) and 11 BLM sensitive species (small-footed myotis, long-eared myotis, fringed myotis, cave myotis, long-legged myotis, big free-tailed bat, pale Townsend's big-eared bat, Pacific Townsend's big-eared bat, black tern, western snowy plover, and Preble's shrew) and potential habitat for one candidate species (spotted frog). Three other special status species that may migrate through the vicinity of the Project due to open water are the federally threatened bald eagle and snowy plover, and the federally listed endangered peregrine falcon (Table 4.9.1).

A report titled, *Special Status Species Review for the Filippini Power Line Right-of-Way Project* (JBR 1996c), which included a portion of the Project Area, listed an additional five sensitive species and one endangered species with potential to occur within the Project Area. Since the JBR report (1996c), agencies have updated their species lists. All currently listed special status species reported to occur or potentially occur in the Project Area are identified in Table 4.9.1.

Table 4.9.2 lists habitat information for potential special status species within the Project Area. The table describes the species preferred or suitable habitat requirements. Based on the geology, hydrology, and vegetation communities present, one species, the Western burrowing owl, actually has preferred habitat within the Project Area. Suitable habitat exists within the Project Area for an additional five special status species (northern goshawk, ferruginous hawk, small-footed myotis, western big-eared bat (pale Townsend's big-eared bat, Pacific Townsend's big-eared bat), and long-eared myotis. Springsnails of the genus *Pyrgulopsis* were not listed in the table because they are no longer a special status species according to 1998 agency lists.

Crescent Valley supports scattered families of burrowing owls (Herron et al. 1985), which are on the Nevada State Protected Animal List. Periodically, an active burrowing owl nest has been observed in the region, north of the Project Area, since 1991 (JBR 1997a; page 4). Two detailed field surveys for nesting burrowing owls have been conducted within and near the Pipeline project area by JBR in recent years. The results of the April - May, 1995 survey (JBR 1995b) are reported in the Pipeline project FEIS (BLM 1996a; pages 3-40 through 3-42), herein incorporated by reference. A second survey by JBR covering the Project Area was conducted in May and June, 1997 (JBR 1997a). No burrowing owls were observed and no active nests were located in the vicinity of the proposed area of disturbance or the Project Area on either survey. However, during both 1997 and 1998, employees of Cortez have reported seeing burrowing owls near the infiltration ponds at the north end of the Project Area, outside the area of proposed disturbance (JBR 1997a; personal communication with Al Reuter, CGM). An active burrowing owl nest was observed within the Project Area in 1991 (JBR 1995b; 1997a). Habitat suitable for nesting exists in the general area of the proposed Project.

Golden eagles, listed by the State of Nevada as protected species, have been observed infrequently within the Project Area. The northern goshawk is listed by USFWS as a species of special concern and by the State of Nevada as a protected animal. Aspen groves are the preferred nesting sites for this species in Nevada. The limited aspen stands in the Project Area represent potential nesting habitat, however, these stands are generally small in size and are not considered high quality goshawk habitat. There is some foraging habitat available in the Project Area if suitable nesting habitat exists nearby. The piñon-juniper/sagebrush and mountain mahogany vegetation types may serve as winter habitat if suitable nesting habitat exists at higher elevations. The nesting habitat that is available in the Project Area is considered low quality nesting habitat and it is not likely that goshawks would inhabit the area except when populations are extremely high and low quality habitat is the only habitat available for nesting (JBR 1997c).

The ferruginous hawk is listed by the State of Nevada as a protected animal. This hawk has been observed in the Project Area, but no nests have been found. These hawks are often tied to jackrabbit populations or populations of both lagomorphs and rodents, particularly ground squirrels. Populations in part fluctuate with jackrabbit populations, which in turn may be due to cheatgrass replacing forbs and perennial grass species favored by jackrabbits. The center of the

Table 4.9.1: Special Status Animal Species that Occur or May Occur within the CESA

Scientific Name	Common Name	Status	Location of Occurrence
Accipiter gentilis	Northern goshawk	Sensitive	Cottonwood Canyon
Antrozous pallidus	Desert pallid bat	Sensitive	Undocumented[a]
Athene cunicularia hypugea	Western burrowing owl	Sensitive	T28N R47E, SE1/4, SW1/4, Sec. 30 & Sec. 17; T27N R47E, Sec. 15
Brachylagus idahoensis	Pygmy rabbit	Sensitive	Within 5 km of T29N R48E, Sec. 7
Buteo regalis	Ferruginous hawk	Sensitive	Undocumented
Charadrius alexandrinus	Snowy plover	Threatened	Transient
Chlidonias niger	Black tern	Sensitive	Undocumented
Euderma maculatum	Spotted bat	Sensitive	Undocumented
Falco peregrinus anatum	Peregrine falcon	Endangered	Transient
Haliaeetus leucocephalus	Bald eagle	Threatened	Transient
Ixobrychus exilis hesperis	Least bittern	Sensitive	Undocumented
Myotis ciliolabrum	Small-footed myotis	Sensitive	Undocumented
Myotis evoits	Long-eared myotis	Sensitive	Undocumented
Myotis thysanodes	Fringed myotis	Sensitive	Undocumented
Myotis volans	Long-legged myotis	Sensitive	Undocumented
Myotis yumanensis	Yuma myotis	Sensitive	Undocumented
Plegadis chihi	White-faced ibis	Sensitive	Undocumented
Plecotus townsendii pallescens	Pale Townsend's big-eared bat	Sensitive	Undocumented
Plecotus townsendii townsendii	Pacific Townsend's big-eared bat	Sensitive	Undocumented
Pyrgulopsis sp.	Springsnail	Possibly undescribed	Four-Mile Creek at approx. 5,750 feet
Rana pretiosa	Spotted frog	Candidate	Undocumented
Sorex preblei	Preble's shrew	Sensitive	Undocumented

[a] Potentially occurring within CESA, yet undocumented

Table 4.9.2: Habitat Preferences of Special Status Animal Species that Occur or May Occur within the Cumulative Effects Area

Species	Habitat Preference
Species with Preferred Habitat within the Project Area	
Western burrowing owl	Nest in burrows typically located in open, level sites or hillsides with low or desert vegetation. Alluvial or sandy soils are preferred. Elevated observation perches preferred.
Pygmy rabbit	Dense stands of big sagebrush growing in deep, loose sediment.
Species with Potential Habitat within the Cumulative Effects Area	
Northern goshawk	Nest primarily in aspen trees in close proximity to water.
Desert pallid bat	Associated with arid environments and rocky outcrops. Desert scrub, piñon-juniper, and grasslands. Roosts in rock crevices, caves, mine tunnels, buildings, trees.
Ferruginous hawk	Nesting habitat is near the forest-shrubland edge, scattered junipers overlooking broad, open valleys. Forage in open country.
Small-footed myotis	Roosts in caves, tunnels, rock crevices, and forested areas. Occurs in variety of habitats. Associated with water or riparian vegetation in desert habitats.
Long-eared myotis	Generally occurs in forested areas, but may also occur in semiarid shrublands, sagebrush, chaparral, and agricultural areas if roosting sites are available. Roost in buildings and under bark of trees. Forages among forest trees and over ponds.
Springsnail	Perennial springs or flow channel below the springs, with riparian vegetation.
Western big-eared bat	Potential roosting habitat in historic mining adits and shafts, forages in riparian areas and areas with open water.
Transient Species with Potential Habitat within the Cumulative Effects Area	
Bald eagle	Forage near open water or upland areas. Primarily nest in large trees, conifers and cottonwoods.
Snowy plover	May utilize playas during the migratory season. Nest primarily in coastal areas.
Peregrine falcon	Usually nest on large rock cliffs and forage in riparian areas.
Least bittern	Tall cattails and sedges, emergent freshwater marshes.

Source: JBR 1996a, http://sevilleta.unm.edu/animal/mammal/pallid_bat.html

Nevada population of this species is located in the east-central part of the state, which contains much of the state's piñon-juniper habitat, interspersed with shrublands. The Project Area does not include any of the preferred nesting habitat, however, the area could be considered foraging habitat (JBR 1996c).

Swainson's hawks are protected animals under Nevada State law. No Swainson's hawks have been documented within the Project Area. However, during annual spring and fall migrations, the species most likely passes over the area. Bald eagles, federally listed as threatened, are common winter visitors to northern Nevada. No nesting habitat or winter roosts for bald eagles exist in the Project Area. No nesting habitat for peregrine falcons exists in the Project Area and no records of this species occurring in or near the project areas exist (JBR 1996c). The pit walls would not be high enough to provide prime nest habitat for peregrine falcons.

Black terns are listed as sensitive by BLM. They are an uncommon nesting species in the marshes of Nevada. This bird feeds mostly on insects over open water (JBR 1996c). No black terns have been identified within the Project Area and the lack of marshes, except at the infiltration sites, limits nesting and open water habitat for foraging, thus making it unlikely for this bird to be present. White-faced ibis, a Nevada State Protected animal, has never been recorded on or near the Project Area and is not expected in the area due to lack of marshy habitat with emergent vegetation (JBR 1996c). The western snowy plover, federally listed as threatened, is a shore bird that has not been recorded in the Project Area and is not expected to be present.

Small-footed myotis, a BLM sensitive species, is a multiple roost bat whose presence is unrecorded within this portion of Nevada. It is possible that the small-footed myotis occurs in the general vicinity of Project Area due to the abundance of historic mining adits and shafts as well as the rock outcrops in the mountains adjacent to the Project Area (JBR 1996c). Long-eared myotis is a BLM sensitive species. It is a multiple rooster and unrecorded in the area. However, it is likely that the long-eared bat occurs in the general vicinity due to the availability of suitable habitats and the widespread nature of this species (JBR 1996c). Fringed myotis is a BLM sensitive species of the multiple roost type and is unrecorded in the area. The species is uncommon in the Great Basin of Nevada and is not likely to be present in the Project Area (JBR 1996c). Long-legged myotis, a BLM sensitive species, is another multiple rooster that is unrecorded and unlikely to be present in the Project Area. The species is widespread in eastern Nevada and has been found in a variety of habitats. Although this species is generally widespread in occurrence and relatively abundant, the preferred forest habitat or desert/riparian habitat combination are not common in the Project Area (JBR 1996c).

Pale Townsend's Big-eared Bat and Pacific Townsend's Big-eared Bat are BLM sensitive species. They are both cave/cavern dwelling bats that are unrecorded, yet possibly live within the Project Area. The two big-eared bats are distributed from the southern portion of British Columbia south along the Pacific coast to central Mexico and east into the Great Plains, with isolated populations occurring in the south and southeastern United States. They have been reported in a wide variety of habitat types ranging from sea level to 10,890 feet. Habitat associations include: coniferous forest, mixed meso-phytic forests, deserts, native prairies, riparian communities, active agricultural areas, and coastal habitat types. Distribution is strongly correlated with the availability of caves and cave-like roosting habitat, with population centers occurring in areas dominated by exposed cavity-forming rock and/or historic mining districts. They roost on open surfaces and are seen in caves and abandoned mines throughout their range. They have also been reported to utilize buildings, bridges, rock crevices and hollow trees as roost sites. This bat species is a moth specialist with more than 90 percent of its diet composed of lepidopterans. Seasonal movement patterns are not well understood, although there is some indication of local migration, perhaps along an altitudinal gradient (Bat Conservation International 1998).

Preble's shrew, a BLM sensitive species, is unrecorded, yet possibly lives within the Project Area. The shrew is found in relatively low elevation shrub-dominated ephemeral and perennial streams. Preble's shrew is a rare shrew throughout its range in the east. Springs and associated habitat in Rocky Pass, at the southern end of the proposed power line project, represent the only potential habitat for Preble's shrew is the Project Area (JBR 1996c).

During 1994 through 1996 springsnails of the genus *Pyrgulopsis* were listed by USFWS as candidates; however, USFWS no longer includes springsnails in its Nevada candidate list. Instead, BLM now lists seven snails, including four species within the genus *Pyrgulopsis,* as sensitive. None of the BLM sensitive springsnails occurs within the geographic range of the Project Area. A survey of the seeps and springs in the area was conducted by JBR (1995a) in December 1994 in response to a request by the USFWS during preparation of the Pipeline project FEIS. A discussion

of the results of that survey in the Pipeline project FEIS (BLM 1996a; pages 3-40 through 3-42) is herein incorporated by reference. The survey documented the location of a population of *Pyrgulopsis* (possibly undescribed) at a single location in the high elevation section east of the Project Area. The host spring is outside the potential drawdown zone area (Geomega 1998a, Chapter 8, page 59). A second survey was conducted in May 1997 (JBR 1997b) of springs that were previously inaccessible or not previously surveyed, which were thought to be within the potential drawdown zone. No additional springsnail locations were found during the 1997 survey.

Surveys of larger waters within Crescent Valley, including Duff, Frenchie, and Indian Creek, have not resulted in locating Lahontan cutthroat trout, a federally listed threatened species (Pipeline project FEIS , BLM 1996a; pages 3-38).

4.9.3 Environmental Consequences and Mitigation Measures

4.9.3.1 Significance Criteria

Based upon NEPA guidelines and commonly accepted criteria, a project would normally be considered to have a significant effect on wildlife resources if it could:

- Substantially disturb critical wildlife habitat;
- Cause the loss of a species or habitat afforded protection under either the ESA or State law; or designated as having special status (e.g., Species of Concern, Sensitive Species, etc.) by an overseeing agency;
- Cause loss of birds protected by the Migratory Bird Treaty Act;
- Eliminate a natural plant community from the Project Area;
- Result in acute or chronic toxicity resulting from exposure to toxic materials in the pit lake or the tailings heap leach facilities; or
- Cause destruction of active bat roosts or maternity sites.

In addition, the potential for any unacceptable risks to local ecological resources from pit lake water quality was evaluated in an ecological risk assessment (EVS 1998). The ecological significance of each wildlife receptor-chemical combination was evaluated based on the following:

- The degree to which hazard quotients exceeded 1;
- The potential for the potential adverse effect to affect populations sustainability; and
- Comparisons with background water quality and tissue concentrations present in Nevada and the western United States.

4.9.3.2 Assessment Methodology

Potential effects on wildlife and fisheries resources are described as direct or indirect, short-term (i.e., during the life of the Project) and long-term. Direct impacts are those that would result in the death or injury of an animal. Indirect impacts include the degradation of wildlife or fisheries habitat to the extent that population numbers decline. Short-term impacts are those that could occur during project implementation and until reclamation is complete. Long-term impacts are those occurring after reclamation is complete. The effects are determined to be significant or not significant based on the applicable significance criteria listed in Section 4.9.3.1.

Closure of the proposed South Pipeline Project would result in the formation of a pit lake. To evaluate the potential for any unacceptable risks to local ecological resources from pit lake water quality, EVS (1998) conducted an ecological risk assessment using standard risk assessment methods (EPA 1992) and BLM guidelines (BLM 1996d). This risk assessment identified five wildlife species in consultation with state and federal agencies to serve as surrogates for the local wildlife community; mallard ducks, western grebes, cliff swallows, bald eagles, and little brown bats (EVS 1998). Water quality of the future pit lake evaluated in the risk assessment was predicted for 29 constituents (Table 4.9.3) using a water quality model (Geomega 1998c). Three separate time periods - 5, 25, and 250 years - were selected to represent specific events in the filling of the pit lake and development of the associated ecological community.

Each pit lake chemical was evaluated in a series of phases to determine whether they posed unacceptable risks to the selected wildlife receptors. The initial screening phase compared predicted chemical concentrations at each time period with water quality levels calculated from wildlife nutritional requirements and toxicity thresholds. Predicted pit lake concentrations less than these limits were identified as not posing unacceptable risks to local ecological resources and were not evaluated further (EVS 1998). Chemicals that were "screened-out" in this phase of the risk assessment are identified in Table 4.9.4.

Table 4.9.3: List of Parameters Included in Geomega's Pit Lake Water Quality Model

Alkalinity	Chloride	Manganese	Selenium
Aluminum	Chromium	Mercury	Silver
Antimony	Copper	Methylmercury	Sodium
Arsenic	Fluoride	Nickel	Sulfate
Barium	Iron	Nitrate	Thallium
Beryllium	Lead	pH	TDS
Cadmium	Magnesium	Potassium	Zinc
Calcium			

Source: This list was developed from the Nevada Division of Environmental Protection Profile I analyte list. See EVS (1998) for further details.

Chemicals with predicted concentrations exceeding wildlife nutritional requirements and toxicity thresholds were further evaluated by calculating receptor specific doses for comparison with the range of available wildlife toxicity data (EVS 1998). Daily chemical doses were calculated for each avian and mammalian receptor using species-specific body weights and ingestion rates of food, water, and /or soil/sediment. These receptor-specific doses were then compared to doses reported in the scientific literature corresponding with no adverse effects as well as doses corresponding with adverse effects. The comparisons consisted of dividing the pit lake derived receptor doses with the no-adverse and adverse literature toxicity doses to calculate hazard quotients (EVS 1998). Combinations of receptors and pit lake chemicals that produce hazard quotients less than 1.0 are unlikely to pose unacceptable risks to local ecological resources and were not considered further in the risk assessment. Chemicals "screened-out" in this phase of the risk assessment are identified in Table 4.9.4.

The remaining nine chemicals were then evaluated to determine the ecological significance of the predicted concentration and the associated adverse reactions which were the basis of the toxicity reference values (EVS 1998). Evaluating the differences in potential risks to wildlife posed by pit lake water quality for the different pit configurations was done by calculating the ratios of metal concentrations for each alternative pit configuration to the metal concentration for the Proposed Action.

The ERA was designed to aid in the EIS decision-making process for the pit lake design. Results of the ERA can be used to establish design criteria for the pit lake, specifically, whether shallow benches should be left in place and whether the lake should be allowed to be stocked with fish. Screening-level ERAs are conservative assessments of potential risks of adverse effects to resident species. Where assumptions are required due to uncertainties or data gaps, attempts are made to assume realistic values, but the assumptions must err on the protective side to be conservative. Since this ERA is based on a lake not yet in existence, many assumptions were required and uncertainty was relatively high for many important variables. It is important that the results of this risk assessment be viewed in light of these screening-level considerations (EVS Consultants [EVS] 1998). The ERA is available for review during normal business office at the BLM Battle Mountain Field Office.

4.9.3.3 Proposed Action

4.9.3.3.1 Environmental Consequences and Mitigation Measures

General Removal of Wildlife Habitat

Construction and operation of the Project would directly affect wildlife habitat through removal of vegetation in areas proposed for surface disturbance, as detailed in Section 4.8 and Figures 3.1.1 and 3.1.2. All of the surface disturbance resulting from the Proposed

Table 4.9.4: Results of Each Risk Evaluation Phase of the Ecological Risk Assessment

	Identified as Not Posing Unacceptable Risks		
Chemical[1]	**In the Initial Screening Phase**	**Based on Calculated Hazard Quotients**	**Based on Ecological Significance**
Alkalinity	X		
Aluminum			X
Antimony			X
Arsenic			X
Barium		X	
Beryllium	X		
Cadmium	X		
Calcium	X		
Chloride	X		
Chromium		X	
Copper		X	
Fluoride			X
Iron	X		
Lead			X
Magnesium	X		
Manganese			X
Mercury	X		
Methylmercury			X
Nickel	X		
Nitrate	X		
pH	X		
Potassium	X		
Selenium			
Silver	X		
Sodium	X		
Sulfate	X		
Thallium		X	
TDS	X		
Zinc			X

1 Bold indicates not identified as not posing unacceptable risks

Action would be within the shadscale/budsage community or previously disturbed areas. The Partial Backfill, Injection, and Water Delivery to Private Land options do not otherwise impact the general removal of wildlife habitat.

▣ **Impact 4.9.3.3.1-1:** Approximately 4,450 acres of wildlife habitat over the currently approved number of acres, would be directly removed as a result of implementation of the Proposed Action. Due to incremental reclamation, this acreage figure would never be disturbed all at one time. Upon completion, the reclamation portion of the Proposed Action would be completed for 3,845 acres or 86 percent of the disturbed area (Section 3.9). Approximately 605 acres of wildlife habitat in the vicinity of the open pit would be removed and not reclaimed.

Significance of the Impact: This impact is considered less than significant and no mitigation measures are required.

Structural Modification of Wildlife Habitat

Post-reclamation wildlife habitat will differ from pre-Project habitat in vegetation compositions and age class. A portion of the Project Area would be converted from a shrub-dominated community to a grass/forb-dominated community in the short-term, as described in Section 4.8. Once reclaimed, the vegetation that became established would, through succession, create a more shrub dominant habitat within three to five years. However, it may take 15 to 20 years to establish mature shrubs. In the short-term, only seed-eating and early forb/grass-eating species such as rabbits and seed eating birds would benefit from reclamation efforts. Other game and most nongame wildlife would benefit more over time, as diversity, cover, nesting habitat potential, and forage quality increased until its peak. The Partial Backfill, Injection, and Water Delivery to Private Land options do not otherwise impact the structural modification of wildlife habitat.

▣ **Impact 4.9.3.3.1-2:** Modification of wildlife habitat and subsequent reclamation efforts would result in less available mature vegetation for cover, forage, and nesting habitat for many species of wildlife, in the short-term.

Significance of the Impact: This impact is considered less than significant and no mitigation measures are required.

Ground Water Drawdown

As discussed in Section 4.8.3.3.1, the mine dewatering system is expected to drawdown the ground water table in an area surrounding the open pit. The extent of the 10-foot drawdown contour is a radius of approximately 7 to 8 miles beyond the pit area 20 years after the end of mining based on ground water modeling results (Section 4.4.3.3). Mine dewatering is not expected to affect flows in streams; nor any of the wildlife habitat they support. Two springs approximately 1 mile east of the Project Area may be impacted by a drawdown of more than 10 feet. Mitigation Measure 4.4.3.3.1-2b is designed to reduce the post-mining impact to springs by restoring the historical yield of the spring. Therefore, impacts to wildlife habitat supported by the springs, if they occur, would be below the level of significance. The Partial Backfill and Injection options do not otherwise impact springs and seeps.

Under the irrigation option, the predicted maximum extent of water table drawdown occurs approximately 25 years after dewatering ceases. By the time the drawdown reaches its maximum lateral extent, five springs would be just inside the modeled 10-foot drawdown contour, and could be slightly impacted. Three of these springs lie approximately 1 mile east of the Project Area and the other two are located near the southwest boundary of the Project Area (Figure 4.4.17). Mitigation Measure 4.4.3.3.1-2b is designed to reduce the post-mining impact to springs by restoring the historical yield of the spring. Therefore, impacts to wildlife habitat supported by the springs, if they occur, would be below the level of significance.

Noise

Noise disturbance would be continuous for approximately ten years during implementation of the Proposed Action alternative. Some wildlife would avoid the area while other wildlife would adapt to the noise and continue normal feeding and breeding activities. The Partial Backfill, Injection, and Water Delivery to Private Land options do not otherwise impact noise as it affects wildlife.

▣ **Impact 4.9.3.3.1-3:** Sudden load noises such as blasts could cause wildlife to disperse in directions away from the sound. This behavior could send animals into unfamiliar terrain or towards a predator. However, since the resident animals in the area are already familiar with the noises at the existing Pipeline project, the residents are not expected to abruptly react to mining noises. Some transient wildlife would avoid the Project Area due to the noise factor.

Significance of the Impact: This impact is considered less than significant and no mitigation measures are required.

Pit Lake Water Quality

The metal concentrations of the pit lake resemble those from other standing water in Crescent Valley because the primary control on pit lake water quality is evaporation of ground water. With the exceptions of chromium, nickel, manganese, molybdenum, and zinc, predicted pit water metal concentrations are comparable to Crescent Valley surface waters. Except for manganese, the aberrant metals are found a concentrations less than twice those reported for Crescent Valley surface waters. The primary differences between pit water chemistry and other surface water bodies are concentrations of the major ion analytes (e.g., TDS, alkalinity, chloride and sulfate). As with the other Crescent Valley surface water bodies, pit lake water would be ingested by aquatic organisms, which in turn could be consumed by other wildlife. The Proposed Action includes bench elevations designed to minimize the development of a littoral zone.

The potential for any unacceptable risks to local ecological resources from pit lake water quality was evaluated in an ecological risk assessment (EVS 1998). The ecological significance of each wildlife receptor-chemical combination was evaluated based on the criteria listed in Section 4.9.3.1.This phase of the ecological risk assessment of the Project concluded that eight of these nine chemicals (Table 4.9.4) were unlikely to pose unacceptable risks to local ecological resources (EVS 1998). The exception was selenium, for which the risk assessment concluded "...cliff swallow exposure to selenium at the South Pipeline pit lake is near the threshold between acceptable and unacceptable risks." A similar conclusion was reached for the exposure of little brown bats to predicted selenium levels in the future pit lake (EVS 1998).

Conclusions concerning selenium were based on the application of bioaccumulation factors (BAF) developed from measurements of water and invertebrate tissues in the neighboring Cortez pit lake (EVS 1998). As stated in the ecological risk assessment:

> "While the Cortez pit lake tissue data were used directly to estimate metal burdens in organisms from the South Pipeline pit lake in the 25-year time period, the BAF approach, using the ratio of tissue concentration to water concentration, was used to extrapolate to both the five- and 250-year time periods. Recent reviews (Chapman et al. 1996; Parametrix 1995) concluded that bioaccumulation of essential metals is non-linear for aquatic organisms. Also, an earlier review (Luoma 1983) discusses how aquatic organisms maintain consistent zinc tissue concentrations over a broad range of environmental conditions. Thus, there is evidence to support the contention that the direct application of BAFs from the Cortez pit lake for essential metals is over conservative; however, the ultimate degree of conservatism is uncertain." (EVS 1998; p. 5-13).

Application of BAFs developed from low water concentrations is very uncertain, as selenium bioaccumulation is highly concentration dependent. The lower the concentration, the higher the BAF in aquatic organisms (and so on up the food chain). The inverse relationship between water selenium and BAFs was not addressed in the risk assessment when using BAFs to predict selenium concentrations in invertebrate prey items in the risk assessment and was the basis for the conclusion quoted above that the "ultimate degree of conservatism is uncertain".

However, a recent review of the literature comparing water and tissue residue levels in aquatic insects and shorebirds has further documented the inverse relationship between selenium BAFs and low-level water concentrations (Adams et al. 1998a). This relationship points out that the use of BAFs and models based on bioaccumulation factors are highly dependent upon the exposure levels and should not be used to predict tissue residues when a single BAF is used in the model. The ratio of water selenium to dietary selenium measured in the Adams et al. (1998a) study changed 3-fold between 1 and 5 μg/L. A similar degree of change between the Cortez pit lake concentration of 0.88 μg/L and the predicted concentration at 250-years in the South Pipeline pit lake, 1.5 μg/L would reduce the hazard quotients for the little brown bat to below a level of significance.

An alternative approach is available to evaluate whether or not selenium concentrations in the future pit lake are unlikely to pose unacceptable risks to the avian community that does not involve the uncertainty associated with the use of these BAFs. The scientific community and the USFWS has invested significant effort to develop water column concentrations to be protective of associated bird species. The current standard to protect birds is 5 μg/L in the water column (Adams et al. 1998b). The USFWS is currently proposing that this standard be lowered to 2 μg/L in the

water column (Lemly 1993; 1996; Lemly and Smith 1987; Skorupa et al. 1996; Renner 1998). Application of either standard to the predicted selenium concentrations in the future pit lake supports the conclusion that selenium will not pose an unacceptable risk to the local ecological resources.

The data and approaches used in the ecological risk assessment coupled with the evaluation presented above supports the conclusion that the water quality in the future pit lake is unlikely to pose unacceptable risks to the ecological resources. The Partial Backfill, Injection, and Water Delivery to Private Land options do not otherwise impact pit lake water quality.

▣ **Impact 4.9.3.3.1-4:** The expected water quality of the proposed pit lake was modeled using an ERA process, as summarized above and in EVS (1998). The projected level of each metal in the pit lake would be below the level of significant risk to insectivorous bats and birds or other wildlife.

Significance of the Impact: This impact is considered insignificant and no mitigation is necessary.

Impacts to Special Status Species

There is only one known Special Status Species that inhabits the Project Area, the Western burrowing owl, a State of Nevada protected animal. This bird has been seen in the area of the existing Pipeline project infiltration sites. There is potential for a short-term increase in habitat for this species as a result of the operation of the infiltration sites.

▣ **Impact 4.9.3.3.1-5:** Increased suitable habitat may be created for the Western burrowing owl as a result of operation of the infiltration sites. An increase in the number of burrowing owls in or near the Project Area may occur.

Significance of the Impact: This impact is considered beneficial and less than significant and no mitigation measures are required.

4.9.3.3.2 Residual Adverse Impacts

The Proposed Action would result in the unavoidable loss of up to 605 acres of terrestrial wildlife habitat resulting from surface disturbance in the open pit area. Approximately 3,845 acres of wildlife habitat would be removed in the short-term and then reclaimed as a result of mine development, operation, and closure. The reclaimed land would have more grass and forb forage and less mature shrub forage in the short-term. Rabbits, hawks, and rodents would benefit the most from the early seral stage vegetation in the short-term. As the plant community matures, within a period of 15 to 20 years, larger shrubs would provide additional cover for larger animals and less of a forage prey base for raptors, similar to the existing situation.

4.9.3.4 Pipeline Backfill Alternative

Impacts to wildlife from the Pipeline Backfill Alternative are generally the same as those described for the Proposed Action. The differences between the Proposed Action and the Pipeline Backfill Alternative that relate to impacts on wildlife habitat are that backfilling would result in less (605 acres) surface disturbance in the area of the South Pipeline waste rock dump than the Proposed Action and the Pipeline open pit would be reclaimed following backfilling (276 acres).

4.9.3.4.1 Environmental Consequences and Mitigation Measures

Impacts to wildlife habitat from changes in structure, ground water drawdown, particulate deposition, and potential loss of habitat for special status species are the same as those described for the Proposed Action (Section 4.9.3.3) and are herein incorporated by reference. The additional acres of habitat reclaimed following backfilling may create a slight benefit to wildlife over the Proposed Action, in relation to acres of available vegetated habitat.

General Removal of Wildlife Habitat

Construction and operation of the Project would directly affect wildlife habitat through vegetation removal in areas subject to surface disturbance. The locations of the proposed disturbance are identified on Figure 3.1.1 and 3.1.2, and the surface acreage by mine facility component is identified in Table 3.1.1. All of the surface disturbance resulting from the Pipeline Backfill Alternative would be within the shadscale/budsage community or previously disturbed areas. The shadscale/budsage community is a common vegetation type in the vicinity of the Project. The habitat type is not highly productive for wildlife.

▣ **Impact 4.9.3.4.1-1:** Approximately 3,841 acres of wildlife habitat would be altered as a result of the construction and operation of this alternative. Reclamation would be incremental such that the entire amount of disturbance would never be reached at any point in time. Reclamation would be completed for 84 percent of the disturbed area

(Section 3.9). In addition, 276 acres of approved disturbance associated with the Pipeline project would be reclaimed following backfilling of the Pipeline pit - an area that was not able to be reclaimed under the Proposed Action or as part of the Pipeline project.

Significance of the Impact: This impact is considered less than significant and no mitigation measures are required.

Pit Lake Water Quality

Evaluating the differences in potential risks to wildlife posed by pit lake water quality for the different pit configurations was done by calculating the ratios of metal concentrations for each alternative pit configuration to the metal concentration for the Proposed Action. The ratios, expressed as the percentage difference based on the 250-year model results, are presented in Table 4.9.5. The Pipeline Backfill Alternative would generally pose greater risk than the Proposed Action. The pit configuration associated with the Pipeline Backfill Alternative would pose lower potential risk due to selenium (the only parameter considered to pose marginal ecological risk in the Proposed Action pit lake), however methylmercury risks would be substantially higher. The predicted higher methylmercury concentration for the Pipeline Backfill Alternative would put the wildlife risks due to methylmercury considerably above a threshold for toxic effects. The difference would outweigh the reduced risk associated with selenium.

▣ **Impact 4.9.3.4.1-2:** The predicted higher methylmercury concentration for the Pipeline Backfill Alternative would put the wildlife risks due to methylmercury considerably above a threshold for toxic effects.

Significance of the Impact: The impact is significant since it may result in acute or chronic toxicity resulting from exposure to toxic materials in the pit lake, and no mitigation measures appear to be feasible to reduce the level of significance of the impact.

▣ **Mitigation Measure 4.9.3.4.1-2:** Due to the uncertainty inherent in ERA's, studies shall be conducted after the pit lake forms to quantify the amount of bat and swallow use of the pit lake and to determine the magnitude of the impact.

The ERA (EVS 1998) presents estimates of risks to wildlife for two alternative littoral zone scenarios, a minimal littoral zone scenario and a moderate littoral zone scenario. The effect of backfilling would create conditions such as those described for the moderate littoral zone scenario. The conditions include 20-foot wide benches shallow enough to support a significant littoral zone with taller vegetation, such as reeds and vegetation types attractive to waterfowl.

▣ **Impact 4.9.3.4.1-3:** The larger littoral zone created by backfilling would result in higher toxicity risks to mallard and western grebe.

Significance of the Impact: The impact is less than significant since the elevated exposure levels are not expected to pose adverse ecological effects in the mallard duck or western grebe.

4.9.3.4.2 Residual Adverse Impacts

The Pipeline Backfill Alternative would permanently eliminate 254 acres of terrestrial wildlife habitat. The reclaimed plant community may have a modified structure in comparison with undisturbed vegetation due to the absence of mature shrubs for a period of 15 to 20 years. Impacts to wildlife during maturation of the vegetative community are the same as those described for the Proposed Action.

The Pipeline Backfill Alternative would potentially result in acute or chronic toxicity resulting from exposure to methymercury in the pit lake based on the 250-year model results.

4.9.3.5 No Action Alternative

Under the No Action Alternative, none of the impacts identified for the Proposed Action would occur.

4.9.3.5.1 Environmental Consequences and Mitigation Measures

Impacts to wildlife under the No Action Alternative would be the same as those described and analyzed in the Pipeline project FEIS (BLM 1996a; pages 4-40 through 4-42). Specifically, removal and reclamation of 2,850 acres of the shadscale/budsage community type and permanent loss of 316 acres of terrestrial wildlife habitat in the area of the open pit. The No Action pit lake poses less risk than the Proposed Action pit lake (Table 4.9.5).

Table 4.9.5: Differences in Concentration of Pit Lake Metals at 250 Years: Comparison of Alternative Pit Configurations with Proposed Action Pit Configuration

Metal	Backfill Alternative	No Action Alternative
Aluminum	6%	-5%
Antimony	28%	-28%
Arsenic	46%	-17%
Barium	-15%	141%
Cadmium	24%	-26%
Chromium	-47%	-22%
Copper	127%	-20%
Fluoride	29%	-13%
Inorganic Mercury	1000%	48%
Lead	56%	-37%
Manganese	33%	-31%
Methylmercury[a]	1000%	48%
Selenium	-27%	-38%
Silver	-25%	-42%
Thallium	35%	-10%
Zinc	2%	-54%

[a] Methylmercury estimated from inorganic mercury concentration, based on measurement of both inorganic and methylmercury in Cortez pit lake.

Source: EVS (1998)

4.9.3.5.2 Residual Adverse Impacts

The No Action Alternative would result in the unavoidable impacts on wildlife habitat described in the Pipeline project FEIS (BLM 1996a; pages 4-41 and 4-67). Specifically, short-term loss of 2,850 acres of vegetation utilized by wildlife for forage, shelter, and breeding; permanent loss of 316 acres of terrestrial wildlife habitat in the area of the open pit; and the degree to which wildlife habitat may not be exactly the same as pre-disturbance conditions over the long-term.

4.10 Cultural Resources

This section summarizes the cultural history of the study area, reviews previous archaeological compliance reports, reports the results of the archaeological field identification effort conducted for the Project, and discusses the impact of the Proposed Action on identified cultural resources. Traditional cultural values and ethnographic research are presented in Section 4.11, Ethnography.

4.10.1 Regulatory Framework

Cultural resources include prehistoric and historic archaeological sites, districts and objects; standing historic structures, buildings, districts and objects; and, locations of important historic events, or sites of traditional/cultural importance. The analysis of cultural resources can provide valuable information on the cultural heritage of both local and regional populations. Several federal laws and implementing regulations require the consideration of cultural resources.

4.10.1.1 National Historic Preservation Act

The National Historic Preservation Act of 1966, as amended (16 USC 470-470w-6; as amended to 1992), is the cornerstone of the federal government's policy on historic preservation. It expresses a general government policy of supporting and encouraging the preservation of cultural resources for present and future generations in the United States by directing federal agencies to assume responsibility for considering these resources in their activities.

The regulations implementing Section 106 (36 CFR Part 800) of the National Historic Preservation Act of 1966 (as amended) require a federal agency with jurisdiction over a federal, federally assisted or federally licensed undertaking to identify all cultural properties on land under its control or jurisdiction that meet the criteria for inclusion in the National Register of Historic Places (National Register) and to afford the Advisory Council on Historic Preservation (ACHP) an opportunity to comment on those actions which may affect them. The 1980 amendments to the NHPA directed the Secretary of the Interior to study means of "preserving and conserving the intangible elements of our cultural heritage such as arts, skills, folklife, and folkways..." and to recommend ways to "preserve, conserve, and encourage the continuation of the diverse traditional prehistoric, historic, ethnic, and folk cultural traditions that underlie and are living expression of our American heritage."

The federal lead agency for a proposed action is responsible for initiating the Section 106 review process and for consulting with the State Historic Preservation Officer (SHPO) and the ACHP. The BLM, as the Surface Managing Agency, is responsible for initiating the Section 106 review process and for coordinating with the SHPO and the ACHP. The Section 106 review process starts with considering the broad environmental consequences of an undertaking, then progressively narrowing the focus until specific problems can be identified, understood, and resolved. Identification and evaluation of historic resources within a project's Area of Potential Effects (APE) is the first step of the process. Subsequent steps involve consideration of effects, which may be followed by additional consultation with the SHPO and the ACHP, as well as other interested parties including Native American peoples.

4.10.1.2 National Environmental Policy Act

The National Environmental Policy Act of 1969 (NEPA), as amended (42 USC 4371 et seq.), also requires that agencies consider the effects of their actions on the cultural environment.

4.10.2 Affected Environment

The Project Area lies on lower slopes and alluvial fans of the Northern Shoshone Range, and the floor of southern Crescent Valley. The prehistoric and ethnographic records indicate an area of interest extending into Grass Valley, the northern Toiyabe Range and Simpson Park Mountains, and north to Beowawe, Battle Mountain, the Humboldt River, and beyond (Elston 1986, Steward 1938, Elston and Bullock 1994 et al. 1992). With regard to the historic record, the area of interest includes the Cortez, Buckhorn, and Bullion mining districts, and the freight and stage routes from Cortez south to Austin, and north to Beowawe (Tingley 1992; Zeier 1993).

4.10.2.1 Study Methods

Cultural resources in the Project Area have been investigated at different levels of intensity. BLM Class I studies review library and archival evidence of regional history and prehistory. Regional reviews at Class I levels are included in Elston and Bullock (1994), Zeier (1993) Ataman et al. (1994), and especially, Delacorte et al. (1992).

Class II studies sample portions of an area to provide estimates of site distribution, density, and significance. To assess cumulative effects of the Pipeline project, Delacorte et al. (1992) conducted one Class II, 6.4 percent sample survey of 170,000 acres forming a broad transect across the southern portion of Crescent Valley from the lower slopes of the North Shoshone Range (including the Project Area) to the southern Cortez Mountains, and as well, northern Grass Valley and the northern Toiyabe Range. Nineteen 0.4 x 0.4 mile sample units of the Class II study, and portions of four more, lie within the Project Area. All sample units were surveyed intensively.

BLM Class III studies are intensive investigations of areas in which impacts are planned or are likely to

occur. As a result of 13 BLM Class III cultural resource surveys, approximately one-third of the Project Area has been the subject of Class III investigations. Approximately 7,106 acres encompassing the entire Project Mine and Process Area and adjacent lands on the north, east, and south have been intensively examined, as have another 1,818 acres distributed elsewhere throughout the Project Area in 19 parcels ranging from 11 to 200 acres in size. Table 4.10.1 lists the studies, all of which are on file in the BLM Battle Mountain Field Office.

4.10.2.2 Existing Conditions

Forty-eight archeological sites, listed in Table 4.10.2, were observed and recorded in the Project Area. One of them represents the remains of the 1936-1961 Gold Acres mining camp and 45 more are scatters of historic trash. Two are prehistoric lithic scatters. None of these sites are considered eligible for the National Register of Historic Places (NRHP).

4.10.3 Environmental Consequences and Mitigation Measures

Any surface-disturbing Project activity constitutes a potential impact to historic properties. In the context of this analysis, an historic property is any archaeological site sufficiently significant as to be eligible for inclusion in the NRHP. Significance criteria have been applied to the 48 archaeological sites located in the Project Area, in order to determine their eligibility for National Register consideration and, therefore, to establish whether any site is an historic property.

4.10.3.1 Significance Criteria

The significance criterion used to evaluate the impacts of the Proposed Action and proposed alternatives on cultural resources is whether or not any action will affect significant historic properties eligible for inclusion in the NRHP.

The NHRP, maintained by the National Park Service on behalf of the Secretary of the Interior, is the nation's inventory of significant historic properties. Significance criteria appear in 36CFR60.4 and are discussed in detail in National Park Service (NPS) (1991a; 1991b) bulletins. To be eligible for National Register consideration, a property must, as a rule, be at least 50 years old and include the following:

- Be associated with events that have made a significant contribution to the broad patterns of U.S. history (Criterion A); or
- Be associated with the lives of persons significant in U.S. history (Criterion B); or
- Embody the distinctive characteristics of a type, period, or method of construction, or represent the work of a master, or possess high artistic values, or represent a significant and distinguishable entity whose components may lack individual distinction (Criterion C); or
- Have yielded, or may be likely to yield, information important in prehistory or history (Criterion D)

Historic sites may achieve importance through any or all of the four criteria, while prehistoric sites (in the intermontane western U.S.) usually, but not always, attain significance through the data inherent in configurations of artifacts and features that make it possible to test hypotheses, amplify current data bases, or reconstruct models of prehistoric cultures in a particular area.

An eligible property must possess integrity sufficient to convey association with past patterns, persons, designs, technologies, or events. Archaeologists and historians assessing integrity observe seven elements of integrity that include the following: location, setting, design, material, workmanship, feeling, and association.

4.10.3.2 Assessment Methodology

Based upon the recommendations of the archaeologists who identified, recorded, and evaluated the 48 archaeological sites within the Project Area, BLM has applied the criteria of significance to each site and determined that none is eligible for inclusion in the NRHP. The State Historic Preservation Officer has concurred with each determination.

4.10.3.3 Proposed Action

4.10.3.3.1 Environmental Consequences and Mitigation Measures

The entire Project Mine and Process Area has undergone intense examination and no significant historic properties were located. Areas outside of the Project Area have not been subject to a known intensive archaeological inventory. Undiscovered significant cultural properties within this area could be impacted. The Partial Backfill, Injection, and Water Delivery to Private Land options do not otherwise impact cultural resources.

Table 4.10.1: Cultural Resource Inventories Undertaken in the Project Area

BLM No.	Source	Inventory Type	Sites Recorded in Project Area
CR 6-1368-0	Raven and McCabe	BLM Class III of 5677 acres (700 in project area)	9
CR 6-1368-1	McCabe 1991	BLM Class III of 1604 acres	8
CR 6-1368-2	McCabe 1992	BLM Class III of 1850 acres	1
CR 6-1368-3	McCabe 1993a	BLM Class III of 2650 acres (2500 in project area)	23
CR 6-1368-4	McCabe 1993b	BLM Class III of 1310 acres	4
CR 6-1368-5	McCabe 1993c	BLM Class III of 1070 acres	0
CR 6-1381-1	Delacorte, et al. 1992	BLM Class II (6%) of 170,000 acres (5600 in project area)	1
CR 6-1528	Johnson 1992	BLM Class III, Linear, 37mi x 200ft	0
CR 6-1711	Hause 1994a	BLM Class III of 125 acres	0
CR 6-1716-0	Hause 1994b	BLM Class III of 95 acres (11.5 in project area)	0
CR 6-1909	Burke 1995	BLM Class III of 550 acres (200 in project area)	3
CR 6-1920	McCabe 1996a	BLM Class III of 100 acres	0
CR 6-1940	McCabe 1996b	BLM Class III, Linear, 1+mi x 100ft	0

▣ **Impact 4.10.3.3.1-1:** Undiscovered significant cultural properties within the unsurveyed portion of the Project Area could be impacted.

Significance of the Impact: This impact is considered potentially significant. The following mitigation measure is provided to reduce the adverse effect of the impact to below the level of significance.

- **Mitigation Measure 4.10.3.3.1-1:** A Class III CRI shall be completed in the unsurveyed areas prior to surface disturbing activities. If a significant cultural resource is identified as a result of the survey, the cultural resource shall be avoided.

4.10.3.3.2 Residual Adverse Impacts

For the reasons stated in Section 4.10.3.3.1, no residual adverse impacts can be expected to accrue to significant historic properties as a consequence of the Proposed Action.

4.10.3.4 Pipeline Backfill Alternative

Impacts of the Pipeline Backfill Alternative to cultural resources would be expected to be similar to the Proposed Action (Section 4.10.3.3.1).

4.10.3.4.1 Environmental Consequences and Mitigation Measures

For the reasons stated in Section 4.10.3.3.1, no impacts would be expected to significant historic properties in the Project Area as a consequence of the Pipeline Backfill Alternative.

Table 4.10.2: National Register Status of Known Archaeological Sites within the Project Area

Agency or Smithsonian Site Number	Description	NRHP Status	Reference
26La071	1936-1961 Gold Acres mine camp	NE	BLM CR 6-1328-0
CrNV-62-6437	Very large historic debris scatter (includes CrNV-62-6650)	NE	BLM CR 6-1368-1
CrNV-62-6438	1935-1945 trash scatter	NE	BLM CR 6-1368-0
CrNV-62-6439	Small glass/can scatter	NE	as above
CrNV-62-6440	Small glass/ceramics scatter	NE	as above
CrNV-62-6441	Large historic trash scatter	NE	as above
CrNV-62-6442	1935-1945 trash scatter	NE	as above
CrNV-62-6443	Small can/glass scatter	NE	as above
CrNV-62-6447	Small trash scatter	NE	as above
CrNV-62-6461	Large trash scatter	NE	as above
CrNV-62-6642	Lithic scatter	NE	BLM CR 6-1381-1
CrNV-62-6804	Trash scatter	NE	BLM CR 6-1368-1
CrNV-62-6805	Prehistoric lithic scatter	NE	as above
CrNV-62-6806	Historic trash scatter	NE	as above
CrNV-62-6807	Historic trash scatter	NE	as above
CrNV-62-6808	1935-1945 trash scatter	NE	as above
CrNV-62-6810	Historic bottle fragments	NE	as above
CrNV-62-6811	Historic trash scatter	NE	as above
CrNV-62-6824	1935-1945 trash scatter	NE	BLM CR 6-1368-2
CrNV-62-6852	1908-1930s trash scatter	NE	BLM CR 6-1368-3
CrNV-62-6853	1933-1970 trash scatter	NE	as above
CrNV-62-6854	1935-1945 trash scatter	NE	as above
CrNV-62-6855	1933-1960 trash scatter	NE	as above
CrNV-62-6856	1920-1970 trash scatter	NE	as above
CrNV-62-6857	1931-1960 trash scatter	NE	as above

(Continued on next page)

Agency or Smithsonian Site Number	Description	NRHP Status	Reference
CrNV-62-6858	1933-1950 trash scatter	NE	as above
CrNV-62-6859	1935-1950 trash scatter	NE	as above
CrNV-62-6860	1933-1964 trash scatter	NE	as above
CrNV-62-6861	1935-1950 trash scatter	NE	as above
CrNV-62-6862	1908-1950 trash scatter	NE	as above
CrNV-62-6863	1931-1964 trash scatter	NE	as above
CrNV-62-6864	Post 1943 trash scatter	NE	as above
CrNV-62-6865	1935-1950 trash scatter	NE	as above
CrNV-62-6866	1912-1950 trash scatter	NE	as above
CrNV-62-6868	1879-1900s trash scatter	NE	as above
CrNV-62-6869	1935-1950 trash scatter	NE	as above
CrNV-62-6870	1935-1945 trash scatter	NE	as above
CrNV-62-6871	1935-1950 trash scatter	NE	as above
CrNV-62-6872	Prehistoric lithic scatter	NE	as above
CrNV-62-6873	1915-1930 trash scatter	NE	as above
CrNV-62-6874	1935-1950 trash scatter	NE	as above
CrNV-62-6875	1935-1945 trash scatter	NE	as above
CrNV-62-6811	Historic artifact scatter	NE	BLM CR 6-1368-4
CrNV-62-6877	1935-1945 trash scatter	NE	as above
CrNV-62-6878	1935-1960 trash scatter	NE	as above
CrNV-62-6879	Historic artifact scatter and well	NE	as above
CrNV-62-8459	Historic roadway	NE	BLM CR 6-1909
CrNV-62-8460	Historic roadway	NE	as above
CrNV-62-8461	Historic roadway	NE	as above

4.10.3.4.2 Residual Adverse Impacts

For the reasons stated in Section 4.10.3.3.1, no residual adverse impacts would be expected to affect significant historic properties as a consequence of the Pipeline Backfill Alternative.

4.10.3.5 No Action Alternative

4.10.3.5.1 Environmental Consequences

Under the No Action Alternative, no impacts would be expected to cultural resources in the Project Area.

4.10.3.5.2 Residual Adverse Impacts

For the reasons stated in Section 4.10.3.3.1, no residual adverse impacts would be expected to affect significant historic properties as a consequence of the No Action Alternative.

4.11 Ethnography

The Project Area falls within traditional Western Shoshone territory. In the discussion below, the Western Shoshone term "Newe" is used to refer to Western Shoshone people, rather than the non-Indian term "Western Shoshone," except where the latter is included in a formal title as it is for the tribal governments.

4.11.1 Regulatory Framework

A number of laws set policy, procedures, and requirements for protecting and evaluating impacts to Native American traditional and religious values and associated places and activities.

4.11.1.1 American Indian Religious Freedom Act of 1978

The American Indian Religious Freedom Act of 1978 affirms United States policy that federal agencies shall assure that their policies and procedures protect and preserve the rights of American Indians to affirm, express, and exercise traditional religions, including access to sites; use and possession of sacred objects; and freedom of worship through ceremonials and traditional rites. The law required a review of policies by federal agencies when it was passed. However, it contains no enforcement provisions or sanctions for policies or procedures that do not comply with the overall policy.

4.11.1.2 Executive Order 13007 of 1996, "Indian Sacred Sites"

Executive Order 13007 adds an element of enforcement to the policy set forth by the American Indian Religious Freedom Act in 1978. It requires the following actions from federal agencies: (a) accommodate access to and ceremonial use of sacred sites by Indian religious practitioners; and (b) avoid adverse physical effects to such sites. Agencies must provide reasonable notice of proposed actions that might "restrict future access to or ceremonial use of, or adversely affect the physical integrity of, sacred sites." Tribes must inform agencies of the existence of such sites.

4.11.1.3 Native American Graves Protection and Repatriation Act

The Native American Graves Protection and Repatriation Act of 1990 (NAGPRA), as amended (Federal Register 62:148), requires consultation with appropriate Indian tribes prior to the excavation of human remains, funeary objects, sacred objects, or objects of cultural patrimony on federal lands. NAGPRA recognizes Native American ownership interests in some human remains and cultural items on federal lands and makes illegal (under most circumstance) the sale or purchase of Native American human remains, whether or not they are derived from federal or Indian lands. Repatriation, on request, to the culturally affiliated is required for human remains and associated funerary objects. Repatriation of other cultural items is dependent upon whether or not the original acquisition of an item was from an individual with the authority to alienate it from the tribal group (43 CFR Part 10).

4.11.1.4 National Historic Preservation Act of 1966, as amended

Section 106 of the National Historic Preservation Act requires federal agencies to take into account effects of their undertakings on properties eligible to the NRHP. Amendments of 1992 provide explicitly for consideration of places of traditional religious or cultural significance as eligible to the National Register. Such places, referred to as "traditional cultural properties," require different consideration from archaeological sites and historic buildings (NPS 1986) when evaluating their significance against National Register criteria. The 1992 amendments also direct federal agencies to consult with appropriate tribes as part of their Section 106 process. Such consultation enables tribal governments and traditional

elders to assist in the following: (a) identifying potentially eligible properties and the values that make them eligible; and (b) assessing project effects on such properties, including identification of mitigation measures where possible.

4.11.2 Affected Environment

The ethnographic discussions in the Pipeline project FEIS are incorporated herein by reference (BLM 1996a; pages 3-55 through 3-57). No Indian Trust Lands are located within or adjacent to the Project Area.

4.11.2.1 Study Methods

Information for this section came from a site visit and discussions with interested Newe people, as described in Chapter 6. The section also draws upon ethnographic information presented in environmental documents prepared for other mining projects in Newe territory, as cited below. In addition, the section presents information from a review of published ethnographic sources about the importance of springs, since these were identified in the information-gathering process as a resource of major concern.

4.11.2.2 Existing Ethnographic Setting

Baseline conditions for ethnography, including information from living Newe people contacted in the early 1990s, are provided in the Cortez Gold Mine Expansion Project DEIS (BLM 1992; pages 3-57 through 3-62). Additional baseline information from the written record is presented here to provide a context for Newe concern about springs. Concern for springs is a consistent Newe issue with mining projects that involve dewatering. For example, see the Pipeline project FEIS (BLM 1996a; pages 3-56 and 3-57) and the DEIS and FEIS for the Lone Tree Mine Expansion Project (BLM 1995a; page 3-123; 1996c; pages 3-14 and 3-15).

Newe knowledge is still passed down orally, but anthropologists and others began recording it in written form in the 20th century. Anne M. Smith's *Shoshone Tales*, published in 1993, is a compendium collected in the 1930s. A number of the tales mention hot springs. One refers to a hot spring near Elko, saying, "Everyone goes to bathe there" (Smith 1993; page 78). There are several versions of a tale that explains how pine nut trees (piñon) spread from one place to other places in Newe territory. The tales describe a journey wherein the travelers camped each night at a hot spring. In two cases, the journey moves from east of present day Austin to Owyhee, and it can be inferred that it went through Crescent Valley. In one case, the hot spring at Beowawe is identified as the camping place (Smith 1993; page 146). In another, the name for the place is given as "Tu Sunguwe" (Smith 1993; page 85).

"Tu Sunguwe" is similar to the name "To-sam-boi" for the hot spring area at Beowawe given by Newe elder Eunice Silva to anthropologist Mary Rusco in 1992 (Rusco 1992; page A-12). Likely both words are the same Newe word, written differently by two anthropologists who are not Newe speakers. Rusco's study of places important to Newe beliefs and practices at the north end of Crescent Valley in the Beowawe area led her to conclude that "two kinds of areas within the study area are regarded as likely to be highly important to traditional religious practitioners. These are springs, which are often sources of power, and prominent land forms, usually the most prominent in the area, which may be used for vision questing" (Rusco 1992; page A-13). This conclusion echoes Clemmer's (quoted in BLM 1992; page 3-60) that "Power spots are always on mountains or on the tops of prominent, isolated rock formations or in springs."

4.11.2.3 Concerns Raised in the Information Gathering Process

Results of information gathering from Native Americans to identify concerns about the Pipeline project are presented in the Pipeline project FEIS (BLM 1996a; pages 3-55 through 3-57). All of these concerns apply to the Project and include the following: (a) reluctance to provide site-specific information because identifying specific places does not protect them; (b) dewatering desecrates the land and Newe cannot approve it because the earth is sacred and Newe have a responsibility to care for the land; (c) this is Newe land governed by the Treaty of Ruby Valley that did not cede lands to the U.S. government; (d) they have knowledge passed down from elders of a time when hundreds of Newe were living in the valley and, consequently, of places that are sacred because they contain burials or remains of old settlements; and (e) people have found isolated burials around Crescent Valley and the surrounding hills.

During the December 1996 tour of the Project Area, Newe spoke of the Treaty of Ruby Valley and reiterated their view that these lands are Newe lands, not lands managed by the BLM. The Newe explained their obligation to care for these lands.

After the tour, the Newe met to discuss their concerns. The primary concern was the effects that this project, and the Pipeline project already underway, would have on water – known springs, the hot water sources around the valley, and the underground water that feeds springs and wells. The Newe explained that there are springs and places around them that are important because of past use when Newe people traveled through the area regularly. Other places are associated with important Newe teachings. The Newe spoke about changes in springs that they have already seen in Crescent Valley and near the Lone Tree Mine that coincide with mine dewatering. The Western Shoshone Defense Project (WSDP) distributed a position statement by Ms. Carrie Dann of Crescent Valley. The statement reiterates the Newe responsibility to protect ancestral lands. It refers to the provision of the 1863 Treaty of Ruby Valley permitting mining, but notes that Newe did not cede the right to regulate such mining. It also points out, "At the time of the signing of the Treaty, the 1872 Mining Law which has given so many 'rights' to companies mining on 'public' lands, did not even exist. It also applies only to U.S. federal land. To this date the U.S. has not proven how they acquired legal title to Western Shoshone land. As the 'supreme law of the land,' the Treaty of Ruby Valley is not restricted or diminished by the 1872 Mining Law." The statement says that the continuing expansion of mining on Western Shoshone lands is an issue that must be discussed in nation to nation negotiations between the U.S. and the Western Shoshone Nation.

In April 1997, four Newe reviewing photographs of springs currently being monitored by CGM for the Pipeline project recognized some places of concern. However, they did not reveal specific locations or provide information about the places. In October 1997, they visited some places of concern with the project anthropologist but again declined to provide specific information.

In November 1997, CGM notified the project anthropologist that there were plans to expand an existing infiltration basin. The project anthropologist forwarded the information to the Newe residents of Crescent Valley. Upon receipt of the notice, the Newe expressed concern about potential impacts from rising ground water levels to a known cemetery where Newe people are buried. The Newe felt that the effects of the existing infiltration basin on local ground water levels should be evaluated prior to expanding the basin.

The Newe who participated in the information gathering process conferred with others to decide which places of concern to identify. Areas sensitive to the Newe were identified in September, 1998.

4.11.3 Environmental Consequences and Mitigation Measures

4.11.3.1 <u>Significance Criteria</u>

The American Indian Religious Freedom Act and E.O. 13007 , Sections 3.6.1.1 and 3.6.1.2, apply to sites used for religious ceremonies or sacred sites. These statutes do not specify criteria for determining whether a project will affect such places. However, for purposes of the analysis in the EIS, with respect to sites used for religious ceremonies as referred to in the American Indian Religious Freedom Act and to sacred sites as referred to in E.O. 13007, a project effect is considered significant if it restricts access to such sites, in some way impedes the exercise of ceremonies at such sites, or affects the physical integrity of such sites.

A site within an avoidance area would be considered susceptible to a significant effect under one (or more) of the following Project-related situations:

- Access reduced or lost (Executive Order 13007)
- Physical destruction or disturbance (Executive Order 13007, NHPA)
- Alteration of setting (NHPA)
- Introduction of visual, noise, or atmospheric elements that are out of character (NHPA); or
- Somehow rendered unsuitable for traditional or religious use (Executive Order 13007).

Effects on National Register eligible properties including properties that are eligible because of traditional religious or cultural values, are assessed in terms of criteria of adverse effect, listed in regulations implementing Section 106 of the National Historic Preservation Act, at 36 CFR 800.9. The effects include the following that are most applicable to traditional cultural properties:

- Destruction or alteration of all or part of a property;
- Isolation from or alteration of surrounding environment; and

- Introduction of visual, audible, or atmospheric elements that are out of character with a property or alter its setting.

In addition to sites that are important for values recognized in the American Indian Religious Freedom Act, E.O. 13007, and the National Historic Preservation Act, plant and animal resources associated with different habitats are of importance to the Newe because of their religious and cultural obligation to act as stewards for the land. Maintenance of all resources, even those resources not used traditionally for food, medicine, or otherwise, is important because the Newe recognize that the well being of these resources is interrelated with other factors and the Newe are responsible for stewardship of the whole. For the purposes of this EIS, a project effect is considered significant if it would diminish particular resource habitat such that it would be reduced by more than one-half within a given section (640 acres) of land. This is an arbitrary measure proposed to capture the Newe concern that local ecosystems such as those around particular springs would be lost if dewatering reduced or eliminated their flow.

4.11.3.2 Assessment Methodology

Previous environmental documents for CGM projects that involved parts of the Project Area were reviewed to identify general issues and specific places of concern. No specific places of concern within the Project Area were identified in either the Cortez Gold Mine Expansion DEIS (BLM 1992) or the Pipeline project FEIS, although the Pipeline project FEIS noted that, "in the view of some of those consulted, to dewater is to violate the religious values of the traditionalist elders, who have a sacred responsibility as stewards of the land" (BLM 1996a; page 4-63).

Interviews with Newe people knowledgeable about the traditional values of the Project Area were conducted. Until CGM proposes to disturb land within an "avoidance area," Newe would not provide information about the nature of the area of concern. Once that information was available, BLM would determine whether any of the laws or policies set forth in Section 4.11.1 apply. If so, BLM would consider effects in terms of applicable significance criteria.

4.11.3.3 Proposed Action

4.11.3.3.1 Environmental Consequences and Mitigation Measures

Interviewees identified no specific places of concern in the areas to be affected by the pit, waste dumps, leach pads, and associated facilities. They identified one sacred site within the infiltration band. The location of the infiltration sites is analyzed in the Pipeline Infiltration Project Environmental Assessment (BLM 1999). The infiltration sites and conveyance corridors will be placed so as to avoid the sensitive site that was identified by the interviewees.

The interviewees also said that they are concerned about springs and their surroundings, because permitting the loss of any spring and its environs would be inconsistent with their responsibilities as stewards of the land. The impacts of the Proposed Action on streams and springs and their environs are analyzed in Sections 4.4.3.3.1 and 4.8.3.3.1. The Partial Backfill, Injection, and Water Delivery to Private Land options do not otherwise impact ethnography.

▣ **Impact 4.11.3.3.1-1:** The drawdown of the water table resulting from the pit dewatering system could potentially affect surface water flow in certain streams and springs and the vegetation that is supported by the streams and springs or tapped into the water table (phreatophytes). This effect is in conflict with Newe stewardship of all resources.

Significance of the Impact: This impact is considered potentially significant since more than 640 acres of vegetation may be affected. No mitigation measures appear to be feasible.

4.11.3.3.2 Residual Adverse Impacts

The potentially significant impact on streams, springs, and related ecosystems as a result of ground water drawdown in the context of the Newe stewardship of resources cannot be mitigated, even though the impacts would not be permanent.

4.11.3.4 Pipeline Backfill Alternative

4.11.3.4.1 Environmental Consequences and Mitigation Measures

No traditional cultural properties or E.O. 13007 sites have been identified in the Project Area that might be. impacted by the Pipeline Backfill Alternative.

Therefore, there are no impacts associated with the Backfill Alternative on traditional Native American religious concerns other than those identified under the Proposed Action, Section 4.11.3.3.

4.11.3.4.2 Residual Adverse Impacts

The potentially significant impact on streams, springs, and related ecosystems as a result of ground water drawdown in the context of the Newe strewardship of resources cannot be mitigated, even though the impacts would not be permanent.

4.11.3.5 No Action Alternative

4.11.3.5.1 Environmental Consequences and Mitigation Measures

There are no impacts associated with the No Action Alternative on traditional Native American religious concerns.

4.11.3.5.2 Residual Adverse Impacts

There are no impacts associated with the No Action Alternative on traditional Native American religious concerns.

4.12 Visual Resources

4.12.1 Regulatory Framework

Scenic quality is a measure of the visual appeal of a parcel of land. Section 102(a)(8) of FLPMA placed an emphasis on the protection of the quality of scenic resources on public lands. Section 101(b) of the National Environmental Policy Act (NEPA) of 1969 required that measures be taken to ensure that aesthetically pleasing surroundings be retained for all Americans.

To ensure that these objectives are met, The BLM devised the Visual Resources Management (VRM) System. The VRM system provides a means to identify visual values; establish objectives for managing these values; and provide information to evaluate the visual effects of proposed projects. The inventory of visual values combines evaluations of scenic quality, sensitivity levels, and distance zones to establish visual resource inventory classes, which are "informational in nature and provide the basis for considering visual values in the land use planning process. They do not establish management direction and should not be used as a basis for constraining or limiting surface disturbing activities" (BLM 1986b).

Visual resource management classes are typically assigned to public land units through the use of the visual resource inventory classes in the BLM's land use planning process. One of four visual resource management classes is assigned to each unit of public lands. The specific objectives of each visual resource management classes are presented in Table 4.12.1.

4.12.2 Affected Environment

4.12.2.1 Study Methods

Visual resources are characterized according to guidelines given in the Visual Resource Inventory Manual (BLM 1986b). The three primary components of the VRM system are scenic quality, visual sensitivity, and visual distance zones. Based on these three factors, land is placed into one of four visual resource inventory classes. The inventory classes rank the relative value of the visual resources and provide the basis for considering visual values in the RMP process.

The study area for visual resources includes those landscapes that viewers would travel through, recreate in, or reside where existing views would be affected by the Proposed Action or its ancillary facilities. The study area for the Proposed Action is bound on the west by the crest of the Shoshone Range; on the east by the crest of the Cortez Mountains; and on the south by the Toiyabe Mountains; and, on the north, the boundary is located several miles north of the town of Crescent Valley (Figure 4.12.1).

4.12.2.2 Existing Conditions

The study area is located in the northern Great Basin section of the Basin and Range Physiographic Province. The Great Basin is characterized by a rhythmic pattern of isolated north-south-trending mountain ranges and wide basins with broad, open vistas. Vast areas of sagebrush and scattered grasses cover the valley basins. Infrequent linear patterns of riparian willows and cottonwoods outline the larger drainages. At higher elevations, mixed shrubs and scattered piñon-juniper forests cover the mountains.

The existing Pipeline mine development and surrounding area are characteristic of the province: a broad, flat-to-gently rolling landscape with abruptly rising foothills to the west (see the photograph on the

Table 4.12.1: BLM Visual Resource Management Classes

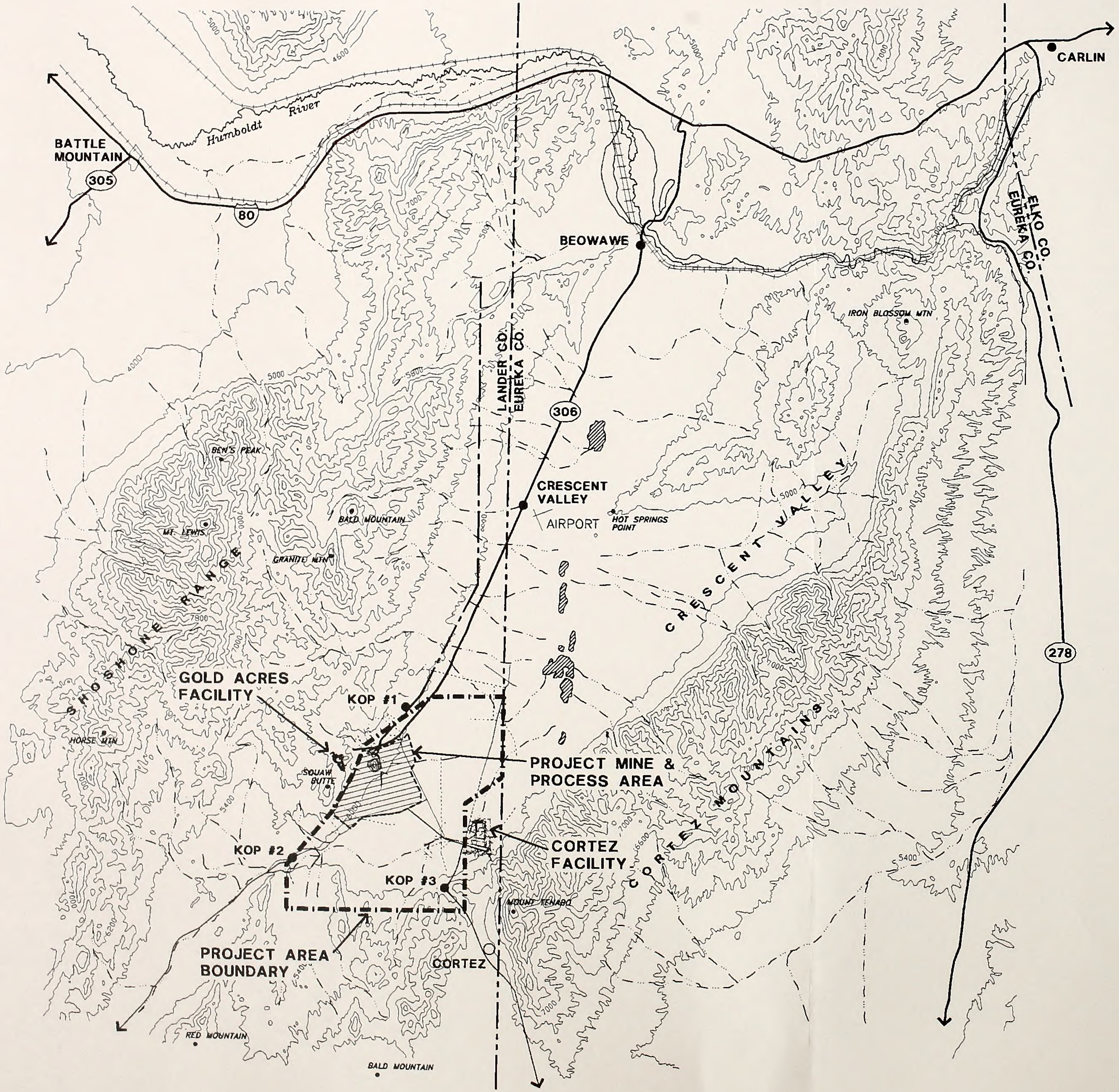
Class	Description
I	The objective of this class is to preserve the existing character of the landscape. This class provides for natural ecological changes, however, it does not preclude very limited management activity. The level of change to the characteristic landscape should be very low and must not attract attention.
II	The objective of this class is to retain the existing character of the landscape. The level of change to the characteristic landscape should be low. Management activities may be seen, but should not attract the attention of the casual observer. Any change must repeat the basic elements of form, line, color and texture found in the predominant natural features of the characteristic landscape.
III	The objective of this class is to partially retain the existing character of the landscape. The level of change to the character should be moderate. Management activities may attract attention, but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.
IV	The objective of this class is to provide for management activities which require major modification of the existing character of the landscape. The level of change to the characteristic landscape can be high. Management activities may dominate the view and be the major focus of viewer attention. However, every attempt should be made to minimize the impact of these activities through careful location, minimal disturbance, and repeating the basic elements.

Source: BLM 1986b

cover of this DEIS and Figure 2.2.1). The elevation of Proposed Action is approximately 5,100 feet. Vegetation is a homogeneous pattern of sagebrush and grasses at lower elevations and piñon-juniper and mixed shrubs at higher elevations. The Proposed Action is located within the vicinity of the existing visually dominant mine disturbance areas. Vegetation colors include tawny, gray, brown, and dark green. Soils range from beige to a chalky off-white color, which, when exposed, contrasts highly with the surrounding vegetation. Rock colors vary from mauve, light to dark brown to burnt orange.

The Gold Acres area contains smooth, rounded, and moderately steep landforms. Vegetation is mottled and finely textured. Colors range from tawny to sage green. A network of lighter colored chalky beige roads are located on foothill slopes. No water forms are apparent. A few blocky-shaped, light-colored, smooth-textured structures are located in the vicinity of the existing mining disturbance. The previously permitted disturbed area contains waste rock piles of lighter brown to reddish-beige colors, which contrast with the surrounding vegetation. Dust plumes from haul truck activity are sometimes visible.

The BLM has established VRM classes for the study area. Land within the study area has been designated VRM Class IV. To the east and southeast of the Proposed Action area are two areas of VRM Class III land. For Class IV lands, the level of visual change to the landscape can be high, dominate the view, and be a major focus of a viewer's attention. For Class III land, the level of change to the landscape should be moderate and should not dominate the view of the casual observer. Despite the Class III and IV designation of land adjacent to and within the Proposed Action area, every attempt should be made to minimize the impact of the proposed activities on the area's visual resources through careful location of Proposed Action facilities, minimal land disturbance, and replication of the basic landscape elements in Proposed Action design and implementation.



EXPLANATION

File: 1298-4121-IGG

Date: 5/18/99

Reviewed By: KK & RD

LOCATION OF KEY OBSERVATION POINTS

Figure 4.12.1

4.12.3 Environmental Consequences and Mitigation Measures

4.12.3.1 Significance Criteria

The assessment of visual impacts is based upon impact criteria and methodology described in the BLM Visual Contrast Rating System (BLM Manual Handbook, Section 8431-1). Effects to visual resources are assessed for the construction, operation, and closure of the Proposed Action. Quality of the visual environment is defined by BLM VRM classes. Two issues, as follows, are addressed in determining impacts: (a) the type and extent of actual physical contrast resulting from the Proposed Action and alternatives and related activities, and (b) the level of visibility of a facility, activity, or structure. These impacts are considered significant if visual contrasts that result from landscape modifications affect:

- The quality of any scenic resources; scenic resources having rare or unique values;
- Views from, or the visual setting of, designated or planned parks, wilderness areas, natural areas, or other visually sensitive land uses; or
- Views from, or the visual setting of, travel routes; and/or views from, or the visual setting of, established, designated, or planned recreational, educational, or scientific facilities, use areas, activities, viewpoints, or vistas.

The extent to which the Proposed Action would affect the visual quality of its viewshed depends upon the amount of visual contrast created between the proposed facilities and the existing landscape elements (form, line, color, and texture) and features (land and water surface, vegetation, and structures). The magnitude of change relates to the contrast between each of the basic landscape elements and each of the features. Assessing the Proposed Action's contrast in this manner indicates the potential impacts and guides the development of mitigation measures that fulfill the VRM objectives.

4.12.3.2 Assessment Methodology

As discussed in Section 4.12.1, the BLM prescribes VRMs for all BLM administered lands, including the area of the Proposed Action and alternatives. The visual effects of the facilities and operations of the Proposed Action were evaluated with respect to conformance with the established VRM. The Analysis was initiated through a review of USGS topographic maps to identify line-of-site points of Project visibility and potential key observation points (KOPs) from which the Project facilities may be visible from routinely accessible vantage points. Potential KOPs were also identified through the following activities:

- Consultation with representatives of the BLM;
- Public Scoping conducted as part of the EIS process; and
- Review of the Pipeline project FEIS.

4.12.3.3 Proposed Action

4.12.3.3.1 Environmental Consequences and Mitigation Measures

Landscape modifications resulting from the construction and operation of the Proposed Action would be within the BLM VRM Class IV objectives (see Figures 1.1.2 and 3.1.2 for a depiction of the Proposed Action). The Proposed Action site is located on VRM Class IV lands, where changes to the characteristic landscape can be high and be the major focus of viewer attention. Although the proposed activity involves expansion of existing mining facilities, as well as the construction of new facilities, the additive increase in visual contrast would not draw significant visual attention.

As is common throughout the Great Basin Physiographic region, views are open and expansive. Potentially sensitive viewing locations (places where people travel, recreate, or reside) were examined and from these, three key observation points (KOPs) were identified and evaluated.

KOP #1 is located on Nevada State Route (SR) 306, at the intersection of SR 306, the Tenabo road and the Dean Ranch road. This KOP is located at the point where the Project Area first becomes visible over the horizon when traveling southbound on SR 306 and where the majority of the public would first view the Project. KOP #2 is located on Lander County Road 225 at the point where the Project Area first becomes visible over the horizon when traveling northbound on Lander County Road 225. KOP #3 is located on Lander County Road 1068 at the point where the Project Area first becomes visible when exiting Cortez Canyon traveling northbound on Lander County Road 106. This point is the only elevated view of the Project Area. Due to their remote location SR 306, Lander County Road 225, and Lander County Road 106, are not routinely

traveled by the general public but rather by persons local to the area who are involved in mineral exploration and development, ranching, hunting, and camping.

Visual impacts resulting from the proposed activities would be similar to those that already exist from past and existing mining activities. When the Proposed Action is viewed in contrast to these activities, it would contrast only slightly with the existing situation and not substantially different from that of the existing operations.

The proposed mining activities would be visible from KOP #1. The KOP is approximately 6.5 miles northeast of the Project Area and represents the view of the majority of viewers traveling through this portion of the study area. Within this distance zone, particularly during midday light conditions, color, form, and line contrasts created by the Proposed Action would be evident. However, the Proposed Action would represent an insignificant additive change to an already highly modified landscape and would not draw strong visual attention.

The proposed mining activities would also be visible from KOP #2. The KOP is approximately 5.5 miles southwest the Project Area. Visual impacts resulting from the Proposed Action would be similar to those that already exist from past and present mining activities. The Proposed Action would represent an insignificant additive change to an already modified landscape and would not draw strong visual attention.

The entire Project Area is visible from KOP #3, an elevated vantage point approximately 6 miles from the project site. The Cortez Canyon KOP is located in the saddle in the southeastern portion from which the Project Acres area is visible. Due to its proximity to the open vistas of the Crescent Valley, an expansive viewshed, incorporating hundreds of miles of landscape, is visible. This viewshed includes the landscape features that characterize the Basin and Range Physiographic Province. Within the context of this expansive vista, the Proposed Action would display the expansion of mining activities, which would create additive visual contrast. While shadow colors would accentuate the appearance of the open pits, the visual change created by the addition of the South Pipeline open pit would be negligible from this viewpoint. The Proposed Action would, therefore, represent a moderate additive change to an existing disturbed landscape that would not draw strong visual attention.

Visual contrast would be reduced by reclamation practices, which would consist of recontouring and revegetating waste dump and heap leach/tailings facility slopes; recontouring and revegetating exploration roads; and removing all buildings, structures, and equipment brought to the site, before recontouring and revegetation of all building sites. Following successful reclamation, the visual contrast of the Proposed Action would be slightly reduced. The use of surrounding landscape colors and native plant materials are appropriate means of reducing visual contrast. Over the long term, natural vegetation would begin to blend with the color and texture of the existing natural landscape. Although recontouring and revegetation of the disposal and heap leach/tailings areas would help to reduce the color and form contrasts, the scale of visual disturbance of these modified pyramidal landforms would remain visually evident. The Partial Backfill Option would slightly reduce the visual impacts of the Proposed Action by decreasing the height of the waste rock dump. The Injection and Water Delivery to Private Land options would not otherwise impact visual resources.

▣ **Impact 4.12.3.3.1-1:** The proposed mining activities would be visible from KOP #1, #2, and #3.

Significance of the Impact: This impact is considered less than significant and no mitigation measures are required, but the following mitigation measure would reduce the adverse effects of the impact.

- **Mitigation Measure 4.12.3.3.1-1:** For reducing visual contrast, minimization of disturbance is the most effective mitigation technique. Where disturbance is proposed, repetition of the basic landscape elements (form, line, color, and texture) would minimize visual change. Clearing of land for waste rock dumps and facility construction would create curvilinear boundaries instead of straight lines to minimize disturbance of the landscape. Grading would proceed in a manner that would minimize erosion and conform to the natural topography.

4.12.3.3.2 Residual Adverse Impacts

The Proposed Action would result in unavoidable but minimal additive physical change in the existing contour and character of the Project Area. The changes would be visibly most apparent over the active life of the Project, but would diminish through the completion

of reclamation and revegetation activities contained as part of the proposed action. The physical changes to the area would be permanent, but would continue to lessen following the completion of final reclamation as natural processes continue to soften the line and form to match the surrounding landscape.

4.12.3.4 Pipeline Backfill Alternative

4.12.3.4.1 Environmental Consequences and Mitigation Measures

Changes to the characteristic landscape associated with implementation of the alternative to partially backfill the open pit would not be noticeably different from those of the Proposed Action. Approximately 250 million tons of waste rock would be returned to the open pit in lieu of adding it to the waste rock dump. However, the amount of waste rock returned to the pit would not appreciably reduce contrasts in form, line and color of the waste rock dump.

4.12.3.4.2 Residual Adverse Impacts

Residual impacts to visual resources would be similar to those described under the Proposed Action.

4.12.3.5 No Action Alternative

4.12.3.5.1 Environmental Consequences and Mitigation Measures

Under the No Action Alternative, additional disturbance and development as described in the Proposed Action would not occur within the Project Area. The visual environment would remain in its current state. CGM would be required to reclaim surface disturbances associated with its currently permitted operations.

4.12.3.5.2 Residual Adverse Impacts

The additional proposed disturbance associated with the Proposed Action would not occur with the No Action Alternative. Visual resources impacts would be limited to on-going, permitted mining and exploration activities.

4.13 Auditory Resources

4.13.1 Regulatory Framework

The State of Nevada and Lander County do not have auditory resources criteria or standards for evaluating auditory resource impacts associated with mining operations. Therefore, auditory resource impacts will be evaluated according to the estimated degree of disturbance to the nearest sensitive receptor sites.

4.13.2 Affected Environment

This section explains the terminology used to describe sound levels and auditory resources and the existing noise conditions at selected locations near the Project. Hearing a sound occurs when rapid variations in air pressure are stimulating or moving the ear drum (tympanic membrane) and this mechanical movement, in turn, stimulates various components of the peripheral and central auditory system. Noise is a sound which is unwanted or not desired and which may disrupt or degrade human activities. The air pressure variations are measured as the change in sound pressure exerted on the diaphragm of a microphone attached to a sound level meter.

Sound is measured in units of decibels (dB) and for environmental purposes usually is measured in units of decibels A-weighted (dBA). A-weighting refers to an electronic technique which simulates the relative response of the human auditory system to the various frequencies comprising all sounds. The sound levels are described in units of dBA, unless stated otherwise. The sound measurement scale (dB) is not linear, it is logarithmic. A logarithmic scale is used because sound levels can span over a very large range and the logarithmic scale permits use of relatively small numbers. For example, sound pressures of about 115 dBA are not uncommon in discotheques or near loudspeakers at rock concerts. A sound pressure at 115 dBA is equal to 10,000,000 micropascals.[1] In contrast, 0 (zero) dBA is the threshold of human hearing, which is equivalent to 20 micropascals. Thus, a range of about ten million pressure units can be described with only 115 dB units. This range is specific to this example, but sound pressure levels of 140 dBA and above have been recorded near rocket engines.

Logarithmic scales cannot be added arithmetically. For example, one sound at 80 dB plus another sound at

[1]Micropascal is the unit of pressure. It is equivalent to 0.00001 Newton/square meter.

80 dB would not equal 160 dB. Because sound is measured on a logarithmic scale, the combined 80 dB sounds would result in a total sound level of about 83 dB. The combined total sound level from two sources is only 40.3 dBA if one sound is at 40 dBA and the second sound is at 29 dBA. The following are rules that may be helpful in understanding this analysis:

- In general, one sound must be at least 3 dB louder than another sound for people to reliably determine that one sound source is louder than a second source; and

- A sound that is about 10 dB louder than a second sound would be perceived as being about twice as loud as the second sound.

Table 4.13.1 shows the approximate sound levels associated with various common sources. Note that the range of sound levels is 75 dBA - from 25 to 100 dBA - and ranges between the very quiet (rustling leaves) to a loud auto horn. The measured sound level decreases with increasing distance between a sound source and the sound-measuring device or the listener. Distances are specified for some sources in Table 4.13.1.

At relatively high levels, noise can be a nuisance because it may interfere with daytime activities such as hearing and understanding speech, it may disrupt sleep, or more generally degrade the quality of life. However, there is no simple answer to the question of "how much noise is too much?" In part, the answer depends on the loudness of the noise relative to ambient or background noise level, when it occurs, what the listener is doing, what the noise source is, and the listener's attitude toward the source. Nonetheless, some reasonably accurate estimates of how communities of people may respond to noise can be made based on measurements and predictions of the A-weighted noise levels expected at some locations. These estimates are based on a fairly large number of scientific studies of community responses to noise at many average noise levels from a wide variety of noise sources (Harris 1991; Kryter 1985; and May 1978). The studies and empirically validated techniques for estimating (predicting) noise levels at receptors (Edison Electric Institute 1984) are used in predicting and evaluating noise effects on humans.

4.13.2.1 Study Methods

The closest noise-sensitive receptors where noise from the existing and proposed operations is or could be heard are assessed in this section. These receptors include the following:

- The Dean Ranch located approximately 6 miles northeast of the permitted Pipeline project;

- The Wintle Ranch located approximately 6.5 miles northeast of the permitted Pipeline project; and

- The Filippini Ranch located approximately 7 miles southwest of the permitted Pipeline project and Rocky Pass.

4.13.2.2 Existing Conditions

Ambient noise level within, and adjacent to, the Project Area have not been measured. However, ambient noise levels around the exterior boundaries of the Project Area are assumed to be relatively low and typical of isolated desert areas (i.e. 35 to 50 dBA), with the exception of traffic traversing exiting highways and roads. However, as one travels closer to the permitted Project Mine and Process Area, noise associated with existing mining operations and blasting becomes much more apparent.

4.13.2.2.1 Mining

Using the information provided in Table 4.13.2, levels of existing mine-generated noise (excluding blasting) at the permitted Pipeline project were estimated to provide a baseline noise level of approximately 90 dBA at a distance of 50 feet from a source. At two of the three sensitive receptors, noise, excluding blasting, generated from the permitted Pipeline project, is estimated to be approximately 40 dBA when weather and wind conditions are such that they attenuate sound.

4.13.2.2.2 Blasting

Although blasts are perceived to be one large explosion, mining blasts are actually a series of smaller, single-hole explosions. Each hole is sequentially delayed and detonated independently of the other holes. Less noise and ground vibrations are generated because several small blasts (delays) are detonated in sequence rather than as one large instantaneous blast. Blasting can be further controlled by varying the amount of explosive, the type of delay, the delay sequence, and the type of explosives.

Blasting at the Pipeline project generally occurs once per day at either 10 a.m. or at 1 p.m. depending on mining activities in the open pit. Blast holes are drilled

Table 4.13.1: Relative Scale of Various Noise Sources

Noise Level (dBA)[a]	Common Indoor Noise Levels	Common Outdoor Noise Levels
110	Rock band	--
105	--	Jet flyover at 1,000 feet
100	Inside New York subway train	--
95	--	Gas lawn mower at 3 feet
90	Food blender at 3 feet	--
80	Garbage disposal at 3 feet, or shouting at 3 feet	Noisy urban daytime
70	Vacuum cleaner at 10 feet	Gas lawn mower at 100 feet
65	Normal speech at 3 feet	Commercial area, heavy traffic at 300 feet
60	Large business office	--
50	Dishwasher in next room	Quiet urban daytime
40	Small theater, large conference room	Quiet urban nighttime
35	--	Quiet suburban nighttime
33	Library	--
28	Bedroom at night	--
25	Concert hall (background)	Quiet rural nighttime
15	Broadcast and recording studio	--
5	Threshold of hearing	--

[a] A-weighted decibel sound scale.

with diesel-powered blast hole rigs and blast holes are then loaded with an ammonium nitrate/fuel oil mixture (ANFO) or a water resistant blasting agent. Blasting takes place only during daylight hours and is conducted under strict Mine Safety and Health Administration (MSHA) safety procedures (Al Reuter, telephone conversation with author, Reno, Nevada, March 4,1997). Estimated noise levels from blasting are assumed to be approximately 115 to 125 dBA at 900 feet. Estimated noise from blasting associated with the permitted Pipeline project at two of the three sensitive receptor sites, excluding the Filippini Ranch, is estimated to be approximately 85 to 95 dBA during the blasting event which lasts no longer than fifteen seconds, one time each day. In addition, as the open pit increases in depth the noise from blasting is increasingly reflected upward by the open pit walls, thus further reducing the noise level. Therefore, the actual noise levels at the sensitive receptors are likely less than 85 dBA.

Other potential noise sources in the vicinity of the Project Area include the following: wind, wildlife, traffic, off-highway vehicle (OHV) usage, and overhead commercial/military flights.

Table 4.13.2: Average Sound Levels for Equipment and Mine Operations

Noise Level (dBA)[a]	Equipment/Operation
115-125 dBA at 900 feet	Blasting
95 dBA at source	Crusher
90 dBA at 50 feet	Haul Trucks
87 dBA at 50 feet	Loaders
86 dBA at 50 feet	Blasthole Drilling
85 dBA at 50 feet	Bulldozers

[a] A-weighted decibel sound scale.

4.13.3 Environmental Consequences and Mitigation Measures

4.13.3.1 Significance Criteria

Noise impacts from mining would be considered significant if the Proposed Action would result in noise levels in excess of 55 dBA, as measured outside at a sensitive receptor site.

Noise impacts from blasting would be considered significant if the Proposed Action resulted in the following:

- Maximum noise levels in excess of 70 dBA measured outside at a sensitive receptor site; or
- Ground vibration as a result of blasting that could initiate or extend observable cosmetic cracking of structures at a sensitive receptor site.

4.13.3.2 Assessment Methodology

Noise impacts were evaluated according to the estimated degree of disturbance to the nearest sensitive receptor sites.

4.13.3.3 Proposed Action

4.13.3.3.1 Environmental Consequences and Mitigation Measures

Noise levels associated with the Project would represent a continuation of Pipeline project mining and construction operations and blasting activities. Mining activities that would continue to generate noise and would be perceptible at the previously identified sensitive receptor sites. Noise would also be generated from construction of a new heap leach facility and growth media stockpiles.

Construction Operations

Existing noise is currently generated by the permitted Pipeline project and would be subsequently generated by the Project and would involve the continuation of operation of stationary equipment and facilities, the operation of heavy mobile construction equipment, and the movement of traffic to and from the mine site.

Noise levels associated with construction related activities (i.e. construction of the tailings facility, heap leach pad, and waste rock dump) are expected to be less than noise levels during active mining operations and are not expected to adversely affect nearby sensitive receptor sites due to their relatively short duration.

Mining Operations

The Project would be expected to continue to operate 24 hours a day, 365 days per year during the projected eight year mine extension. The Proposed Action involves several discrete components that would contribute to the auditory resource environment. The first of these components include drilling into rock formations using diesel powered blast hole rigs for blasting. The next component involves excavating rock

from the open pit using electric/hydraulic shovels and bulldozers. Then, 85-ton to 310-ton haul trucks transport material from the open pit to either the appropriate ore processing facility or the waste rock dump. Then using front-end loaders, bulldozers, and haul trucks, ore grade material is loaded on a stacking conveyor which conveys this material to a primary crusher and then on to the milling circuit. Ore would be slurried and then conveyed to the Carbon-in-Leach (CIL) circuit then sent to the refinery where gold is poured into a bar mold and prepared for shipment.

Specific components and equipment would generate higher levels of noise. A maximum sound level of 100 dBA at 50 feet from any source has been assumed for the purposes of this analysis. 100 dBA is higher than a diesel engine in good repair and is also much louder than a typical processing plant. At a distance of 5 miles from the source, this noise level would reduce to background. Ground absorption effects have not been assumed in this calculation, but atmospheric absorption was included. Any topographic shielding, including construction of the South Pipeline waste rock dump would reduce this value. In conclusion, it is unlikely that mining and construction noise associated the Project would be audible at the three sensitive receptor sites, except in extreme cases, when it would be barely detectable. The Partial Backfill, Injection, and Water Delivery to Private Land options do not otherwise impact auditory resources associated with construction and mining operations.

▣ **Impact 4.13.3.3.1-1:** The Proposed Action would extend the existing mining- and construction-related noise impacts, excluding blasting, which would likely not exceed 55 dBA at the sensitive receptor sites.

Significance of the Impact: This impact is considered less than significant and no mitigation measures are required.

Blasting Activities

Blasting within the open pit would continue to occur once per day at either 10 a.m. or 1 p.m. and only during daylight hours. Blasting related noise levels at sensitive receptors would decrease as the open pit increases in depth and the open pit wall reflect noise upward. The Partial Backfill, Injection, and Water Delivery to Private Land options do not otherwise impact auditory resources associated with blasting.

▣ **Impact 4.13.3.3.1-2:** Blasting associated with the Proposed Action would continue at a frequency of one blast a day and estimated blasting-related noise levels would be similar to existing levels, which would likely exceed 55 dBA at two of the three sensitive receptor sites.

Significance of the Impact: This impact is considered potentially significant. The following mitigation measure is provided to reduce the adverse effects of the impact, but the impact would remain significant after implementation of the mitigation measure.

- **Mitigation Measure 4.13.3.3.1-2:** Blasting shall occur once per day and be no longer than 15 seconds in duration per blast.

4.13.3.3.2 Residual Adverse Impacts

The residual adverse effects on the environment from noise generated during mining activities associated with the Proposed Action would be that blasting-related noise levels would be similar to existing levels, which would likely exceed 55 dBA at two of the three sensitive receptor sites.

4.13.3.4 Pipeline Backfill Alternative

4.13.3.4.1 Environmental Consequences and Mitigation Measures

The noise related impact under the Pipeline Backfill Alternative would be similar to that described for the Proposed Action. The impacts and mitigation measures outlined for the Proposed Action (Section 4.13.3.3.1) are incorporated for the Pipeline Backfill Alternative.

4.13.3.4.2 Residual Adverse Impacts

The residual adverse effects on the environment from noise generated during mining activities associated with the Pipeline Backfill Alternative would be that blasting-related noise levels would be similar to existing levels, which would likely exceed 55 dBA at two of the three sensitive receptor sites.

4.13.3.5 No Action Alternative

4.13.3.5.1 Environmental Consequences and Mitigation Measures

The noise related impact under the No Action Alternative would be similar to that described for the

Proposed Action, except the duration of the impact would occur for ten less years. The impacts and mitigation measures outlined for the Proposed Action (Section 4.13.3.3.1) are incorporated for the No Action Alternative.

4.13.3.5.2 Residual Adverse Impacts

The residual adverse effects on the environment from noise generated during mining activities associated with the No Action Alternative would be that blasting-related noise levels would be similar to existing levels, which would likely exceed 55 dBA at two of the three sensitive receptor sites.

4.14 Land Use, Access, and Public Safety

4.14.1 Regulatory Framework

4.14.1.1 Land Use

Relevant plans and policies include the following:

- Lander County Master Plan;
- Lander County Policy Plan for Public Lands;
- Lander County Zoning Regulations;
- BLM Shoshone-Eureka RMP; and
- 43 CFR Subpart 3715 - Use and Occupancy Under the Mining Laws.

The state-mandated Lander County Master Plan (Master Plan) is a comprehensive, long-term document designed to promote the public health, safety, and general welfare of the county. The Master Plan strives to achieve a balance between development and economic, social, and environmental resources. The Master Plan consists of 12 elements: Conservation and Natural Resources, Historic Properties Preservation, Land Use, Interim Plan for the Management of Public Lands, Population, Housing, Economics, Recreation, Community Design, Transportation, Public Facilities and Services, and Safety Plan (County of Lander 1994).

The Conservation and Natural Resources Element of the Master Plan focuses on cultural and scenic resources, mineral resources, and other environmental resources, including the safety and environmental problems associated with the County's natural features. A primary goal of the Conservation and Natural Resources Element is as follows:

> Insure continued use of natural resources for economic growth and development in Lander County. Management and use of such resources should be consistent with the Lander County Plan for Federally-Managed Public Lands.

The Element also sets forth the following minerals policy (County of Lander 1994):

> Encourage exploration for and development of mineral resources in Lander County.

The Land Use Element analyzes the existing land uses of the county and provides goals and policy guidelines for the planning of appropriate land use types, location, intensity, and the design of future community development. The Land Use Element contains the following policy related to the Project (County of Lander 1994; page 4-18):

> Encourage and protect economic development and uses of lands managed by federal agencies in Lander County. Multiple use principles should be maintained.

The Master Plan includes an Interim Plan for the Management of Public Lands. According to the interim plan, any decisions by government entities regarding public lands should be evaluated by the county for the amount of protection provided for existing land uses, such as ranching, farming, mining, and recreation.

Lander County, in cooperation with the Nevada Division of State Lands, has adopted a *Policy Plan for Public Lands* within its jurisdiction (County of Lander 1984). This plan was developed in response to Nevada Senate Bill (SB) 40, which directs the State Land Use Planning Agency to work with local planning entities to prepare local plans and policies regarding the use of federal lands in Nevada. Policies contained within this plan include providing for the long-term availability and responsible development of mineral resources and promoting opportunities for local economic development through the disposal of select public lands within the county.

The *Policy Plan for Public Lands* was updated in April, 1999. The Proposed Action is consistent with Section X of the *Lander County Policy Plan for Public Lands, Draft of 4/1/99* (Lander County 1999), which sets forth the policy to "promote the expansion of mining operations and areas." The *Lander County Policy Plan for Public Lands, Draft of 4/1/99*, also states that mine site reclamation standards should be consistent with the best possible post-mine use for each specific area, and

that specific standards should be developed for each property.

Lander County zoning and other land use regulations are designed to promote land use compatibility by designating acceptable uses and activities within identified areas or zones. Zoning regulations promote or prohibit uses, and designate appropriate building classes or structures within the various zones which are, in part, intended to prevent or inhibit conflicting or incompatible growth or uses within the respective zones. The Project Area is currently zoned A3 - Farm, Forestry and Open Reserve (Leanne Gandolfo, Lander County Department of Building and Planning, telephone conversation with author, October 10, 1997).

Public lands under BLM jurisdiction are managed for the multiple uses of recreation, range, forestry, mineral extraction, watershed, fish and wildlife habitat, wilderness, and natural, scenic, scientific and historical values. The Project Area is contained within the BLM's Battle Mountain Field Office. The current operational land use plan for this region is the Shoshone-Eureka RMP (BLM 1987). The plan covers 4.3 million acres of BLM-administered public lands in parts of Lander, Eureka, and Nye Counties.

The BLM recently adopted regulations at 43 CFR Subpart 3715 to address the unlawful use and occupancy of unpatented mining claims for non-mining purposes. The regulation limits such use or occupancy to that which is reasonably incident.

4.14.1.2 Access

The Transportation Element of the Lander County Master Plan primarily describes transportation issues related to Battle Mountain. The Transportation Element does, however, list the transport of hazardous materials through communities located along major transportation routes as a concern (County of Lander 1994).

4.14.1.3 Public Safety

Federal hazardous material and waste laws and regulations would be applicable to hazardous substances used, stored, or generated by the Project. Applicable federal laws would include the following: the Resource Conservation and Recovery Act (RCRA); Hazardous and Solid Waste Amendments (HSWA); Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA; aka Superfund); and the Superfund Amendments and Reauthorization Act (SARA). Pursuant to regulations promulgated under Section 102 of CERCLA, as amended, release of a reportable quantity of a hazardous substance to the environment in a 24-hour period must be reported to the National Response Center (40 CFR Part 302). A release of a reportable quantity on public land must also be reported to the BLM.

Similarly, Nevada hazardous material and waste laws and regulations would be applicable to hazardous substances used, stored, and generated by the Project. NAC 445A.240 requires immediate reporting of a release of a reportable quantity of a hazardous substance to the Nevada Division of Emergency Management.

All hazardous substances would be transported by commercial carriers or vendors in accordance with the requirements of 49 CFR. Title 49 CFR requires that all shipments of hazardous substances be properly identified and placarded. Shipping papers must be accessible and include information describing the substance, immediate health hazards, fire and explosion risks, immediate precautions, fire-fighting information, procedures for handling leaks or spills, first aid measures, and emergency response telephone numbers. Title 49 CFR also requires that the carrier notify local emergency response personnel, the National Response Center (for discharge of reportable quantities of hazardous substances to navigable waters), and the U.S. Department of Transportation (USDOT) in the event of an accident involving hazardous substances. Carriers would be licensed and inspected as required by the Nevada Department of Transportation (NDOT). Tanker trucks would be inspected and have a Certificate of Compliance issued by the Nevada Motor Vehicle Division. The permits, licenses, and certificates are the responsibility of the carrier.

The Lander County Master Plan includes a Safety Plan Element. The Safety Plan Element identifies the transportation of hazardous and volatile materials through communities in Lander County as a primary safety problem. The Lander County Department of Emergency Management developed an Emergency Response Plan (adopted in 1994) to comprehensively plan for effective mitigation, preparation, response, and recovery of any natural, technological/man-made, or war-related disaster (County of Lander 1994).

The metal mining industry will begin to submit in 1999 reports on release of chemicals to the EPA and appropriate state agencies, under Section 313 of the

Emergency Planning and Community Right-To-Know Act (EPCRA) of 1986; commonly referred to as the Toxics Release Inventory (TRI) Program. Reports are due on July 1st for the previous reporting year. Therefore, the mining industry will submit reports by July 1, 1999 for the 1998 reporting year. EPCRA also requires industries to participate in emergency planning and to notify their communities of the existence of, and routine and accidental releases of, any chemical on the TRI chemical list. The goal is to help citizens, government officials, and community leaders to be better informed about the industrial use of chemicals in their communities. The TRI program was originally developed for manufacturing facilities that use man-made chemicals to produce other man-made chemicals (such as the synthetic organic chemical industry).

There are four criteria that a facility must meet to file a TRI report called a Form R: (a) the facility's primary Standard Industrial Classification (SIC) Code is on the TRI list (which includes SIC 1041 - Gold Mining); (b) the facility employs 10 or more full-time equivalent employees in the reporting year; (c) the facility "manufactures," "processes," or "otherwise uses" a chemical on the TRI chemical list; and (d) the facility exceeds the activity thresholds for a TRI chemical. There are approximately 700 chemicals, chemical compounds, and chemical groups (which includes a number of individual chemicals) on the TRI chemical list. The actual number of chemicals on the TRI list is greater than 1,000.

The following is a description of the activity thresholds defined as manufacture, process, or otherwise use:

Manufacture - To produce, prepare, import, or compound in quantities greater than 25,000 lbs/year of a TRI chemical. Manufacturing applies to a TRI chemical that is coincidentally produced during the manufacture, processing or otherwise use or disposal of another chemical or mixture of chemicals as a byproduct or impurity. An example would be the coincidental manufacture of AuCN in the gold extraction process used by heap leach gold mining facilities;

Process - The preparation of quantities greater than 25,000 lbs/year of a TRI chemical, after its manufacture, for distribution in commerce. This may be in the same or different form and physical state as received or as part of an article containing the TRI chemical. An example of processing activity in gold mining would be the grinding of TRI chemicals which are associated with gold ore such as copper or silver; and

Otherwise Use -The use of a TRI chemical, in quantities greater than 10,000 lbs/year, that does not fall under the manufacture or process definitions. For example, the use of cyanide in the extraction of gold.

Facilities that meet the four criteria for any of the TRI chemicals must then estimate the amounts of these chemicals which are released to the environment, transferred to other locations, recycled, treated, or burned for energy recovery. Facilities must report the final disposition of the chemicals released in that reporting year. The definition of a "release" under the TRI program is different than other environmental programs. For the purposes of Section 313, a release is defined as any spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing into the environment (including the abandonment or discarding of barrels, containers, and other closed receptacles) of any "toxic chemical." An example of this is the disposal of material to a permitted landfill or permitted disposal facility which would not be considered a release under state or federal environmental programs, but would be considered a release under the TRI program.

The metal mining industry is part of a group of industries that has been recently added to the TRI program that are not classified as traditional manufacturing facilities, i.e., not covered by the U.S. Department of Commerce as a manufacturing industry (different SIC code). As a result, the program as originally designed (for the manufacturing industry, SIC 20-39) does not fit metal mining industries (SIC 10) because these industries conduct activities as part of their operations which are not part of a traditional manufacturing operation. An example for the metal mining industry is the actual mining operation which produces large volumes of earthen material that are permitted by state and federal environmental programs to be moved from one location on the ground to another location on the ground. As a result, under the TRI program any TRI chemicals in this earthen material, commonly called waste rock, would be considered released to land if an activity threshold for that chemical is exceeded.

Data are submitted annually by covered facilities on the Form Rs. Data are reported by individual chemical or chemical group on a facility basis. On the federal level, EPA checks these data on the Form Rs for reporting errors and then compiles them into a centrally managed

database. Each year, over 80,000 reports, representing billions of pounds of released chemicals, are submitted to the EPA by more than 20,000 private facilities and 200 federal facilities.

4.14.2 Affected Environment

4.14.2.1 Study Methods

The baseline data presented below is based upon information from the Pipeline project FEIS (BLM 1996a; pages 3-52 through 3-53) and its precursor, the Cortez Gold Mine Expansion Project DEIS (BLM 1992; pages 3-51 through 3-53). Discussions of existing land uses, rights-of-way (ROWs), and access are incorporated by reference. New and supplemental information obtained from more recent public agency maps and reports, and from telephone communications with federal, state, county, and community officials has been added.

4.14.2.2 Existing Conditions

4.14.2.2.1 Land Use Authorizations

As discussed in Section 1.1, the Project Area is located in Lander County in T27N, R47E and T28N, R47E (M.D.B. & M.). The Project Area is located on the lower slopes and alluvial fans of the Northern Shoshone Range and the floor of southern Crescent Valley east of the Cortez Mountains. Approximately 98 percent, or 38,390 acres, of the Project Area consists of public lands. The remainder of the Project Area is located on private lands controlled by CGM (see Figure 4.14.1). Unpatented lode mining claims within the Project Mine and Process Area are listed in Table 4.14.1.

Nearly 90 percent of Lander County lands are owned by the federal government and managed by the BLM. Other major federal resource agencies having land management responsibilities in the county are the U.S. Forest Service (USFS) and United States Bureau of Reclamation (USBR). Lands managed by the USFS include the Toiyabe National Forest located in the southern portion of the county. The USBR manages land and water rights along the Humboldt River acquired by the federal government in 1935. This land is used by the Pershing County Water Conservation District for cattle grazing (Personal Communication, Mike Andrews, USBR, October 15, 1997). BLM-administered public lands comprise approximately 90 percent, or 3,010,716 acres, of the total federally-owned lands in Lander County. Private lands comprise approximately 7 percent of the County (Nevada Division of Water Planning 1997). As described in the Land Use Element of the Master Plan, the single greatest land use within the county is open space agricultural, comprised of a series of designated grazing allotments. Mining represents the next largest land use within the County. The U.S. Department of Defense (DOD) has designated certain areas within the County as special use airspace for military training (County of Lander 1994).

Land uses within the Project Area consist primarily of livestock grazing and mineral exploration. The Project Area is located approximately 13 miles southwest of the town of Crescent Valley which is located in Eureka County and has a population of approximately 330 (Nevada State Demographer 1998). The nearest population center in Lander County is Battle Mountain, located approximately 30 miles northwest of the Project Area. The nearest residence to the Project is the Filippini Ranch, a cattle ranch, located to the southwest approximately 5 miles. Other ranches in the vicinity of the Project, all primarily cattle ranches, include the Dean Ranch, approximately 7 miles northeast of the Project, and the Wintle Ranch, located approximately 5 miles northeast of the Project. Livestock grazing on the Project Area and surrounding ranches in Lander County is discussed in detail in Section 4.6.

Mining in the Cortez-Gold Acres District began with the discovery of silver ores in 1862. Modern production in the area began in 1968 at the Cortez Facilities. Existing mining operations in the area include Cortez, Gold Acres, and Pipeline. The Cortez Facilities are located approximately 1 mile from the Project Area on the southeast side of Crescent Valley on the flanks of the Cortez Mountains. Gold Acres is located approximately one-half mile west of the Project Area. Other major mines located in Lander County include the Greystone Barite Mine located 8 miles west, and Mule Canyon Mine located approximately 10 miles north, the McCoy/Cove Mine located 30 miles southwest, the Reona Mine located 30 miles northwest, and the Argenta Barite Mine located 25 miles north, of the Project Area (Nevada Bureau of Mines and Geology 1996).

Existing ROWs located within the Project Area are summarized in Table 4.14.2 and are depicted on Figure 4.14.1. Changes to the existing ROWs proposed for the Project include the abandonment of a portion of the Gold Acres Haul Road between Gold Acres and Lander County Road 225 (N-7803) (see Section 3.6.8).

Table 4.14.1: Unpatented Lode Mining Claims within the Project Mine and Process Area

Claim Name	BLM NMC Serial Number	Claim Name	BLM NMC Serial Number
Jacquwyn	71684	GAS 182-183	429258-429259
Gold #33	76851	GAS 199-208	429275-429284
Gold #76-78	76894-76896	GAS R16-R25	671312-671321
Gold R3	671296	GAS R31-R41	671322-671332
Gold R5-R10	671298-671303	GAS R45-R55	671333-671343
Gold 5A	671305	GAS R59-R69	671344-671354
Gold 6A	674700	GAS R71-R81	671355-671365
Gold 10A	674701	GAS R113	671366
GAS 26-58	403033-403065	GAS 25A	671367
GAS 70	403077	GAS 41A	671368
GAS 82-95	403089-403102	GAS 55A	671369
GAS 102-126	410529-410553	GAS 69A	671370
GAS 131-133	429207-429209	GAS 72A	671371
GAS 137-140	429213-429216	GAS 74A	671372
GAS 144-146	429220-429222	GAS 77A	671373
GAS 152-156	429228-429232	GAS 79A	671374
GAS 160-166	429236-429242	GAS 81A	671375
GAS 170-179	429246-429255	GAS 113A	671376

4.14.2.2.2 Access

Primary access within Lander County is furnished by Interstate 80 (I-80), U.S. Highway 50, State highways, county roads, and public access roads. The majority of public lands are accessible to the general public via one of these roads. I-80 and U.S. Highway 50 are the primary east-west highways in north-central Nevada. SR 305 is the main north-south corridor through the county, connecting Battle Mountain (along I-80) and Austin (along U.S. Highway 50).

The Project Area is reached from U.S. I-80 by traveling approximately 38 miles south on SR 306, which traverses Crescent Valley from north to south. The highway is paved from I-80, through the town of Crescent Valley to about 12 miles south where it terminates at the junction with Lander County Road 225, in the immediate vicinity of the Pipeline facilities. Lander County Road 225 continues south as a gravel road (BLM 1996a; page 3-53). As described in Section 2.6.8, Lander County has acquired the ROW from the BLM for that portion of former SR 306 from its junction with County Road 225 to Gold Acres. This portion of road has been designated Lander County Road 306. Other gravel and dirt roads, including County Road 108B, the Cortez Mine Road, and BLM

Table 4.14.2: Rights-Of-Way and Land Use Authorizations within the Project Area

Serial Number	Right-of-Way	Location	Total Width (feet)
NVN-61182	Power Transmission Line	T27N, R46E; Sec 1,12,13,22,23 T27N, R47E; Sec 6	25
N-30650	Telephone Line	T27N, R46E; Sec 13, 23 T27N, R47E; Sec 5, 7, 8, 18	10
N-2434	Power Transmission Line	T27N, R47E; Sec 1	40
N-55643	Geothermal Lease	T27N, R47E; Sec 5, 6	---
N-43670	Gold Acres Haul Road	T27N, R47E; Sec 5,6, 8, 9, 10, 15	125
N-7803	Telephone/Telegraph Line	T27N, R47E; Sec 5, 6, 8, 9, 10, 15 T28N, R47E; Sec 31	20
N-61182	Power Transmission Line	T27N,R47E; Sec 6	25
N-58510	Lander County Road 225	T27N, R47E; Sec 7, 8, 9, 10, 18	60
R-4269	Windmill	T27N, R47E; Sec 8	---
N-52181	Oil and Gas Lease	T27N, R47E; Sec 10, 11	---
N-36596	Airport Runway	T27N,R47E; Sec 14, 15, 22	---
N-52186	Oil and Gas Lease	T27N, R48E; Sec 18	---
N-2615	Power Transmission Line	T28N, R47E; Sec 13, 14, 23	25
N-044669	SR 306 (Hard Surface)	T28N, R47E; Sec 15, 16, 21, 22, 28	400
N-56088	Power Transmission Line	T28N, R47E; Sec 15, 16, 21, 28, 29, 30	80
N-2616	Underground Telephone Line	T28N, R47E; Sec 24 T28N, R48E; Sec 18, 19	20
N-60542	Lander County Road 306 (Hard Surface)	T28N, R47E; Sec 28, 29, 30	150
N-60542	Road (Improved Dirt)	T28N, R47E; Sec 29	100
N-43670	Road (Improved Dirt)	T28N, R47E; Sec 31	125
N-61283	Geothermal Lease	T28N, R47E; Sec 31, 32	---
N-2434	Power Transmission Line	T28N, R48E; Sec 24, 25, 36	40
N64-81-001P	Water Line	T28N, R47E; Sec 32, 33, 28, 21, 15, 27, 14	--
Proposed	Water Line	T28N, R47E; Sec 32, 33, 28, 21, 15, 27, 14	30

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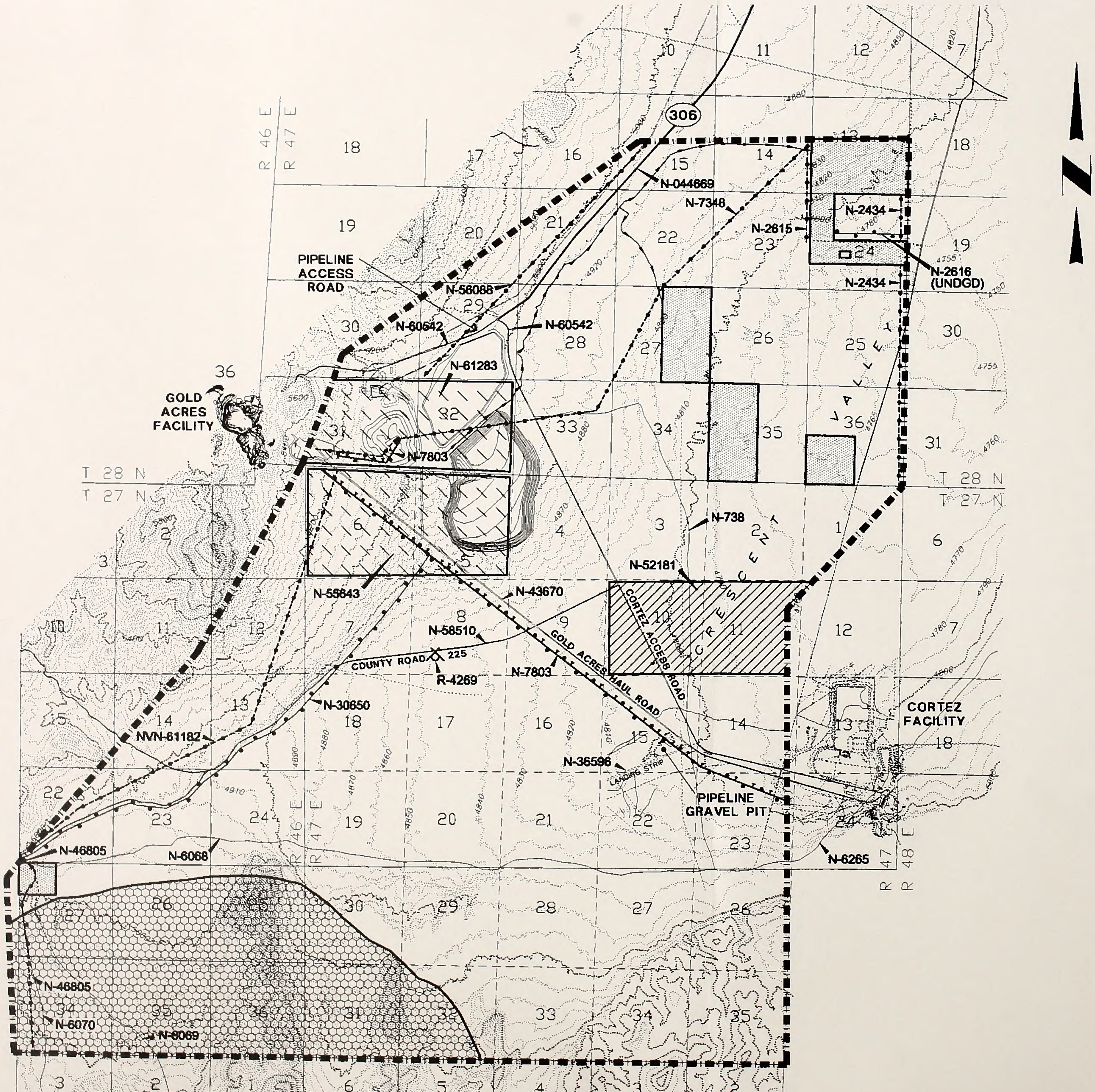

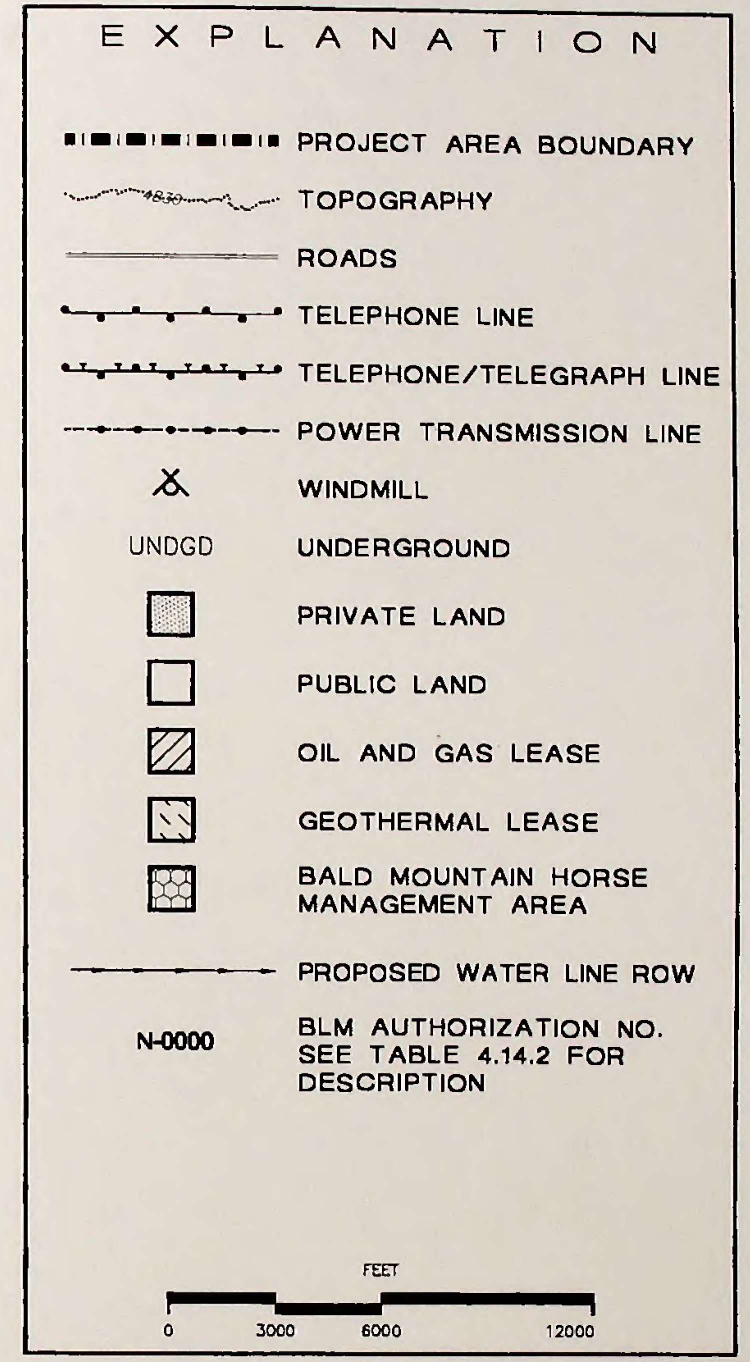

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Date: 5/18/99

Reviewed By: KK & RD

LAND STATUS, ACCESS, AND RIGHTS-OF-WAY IN PROJECT AREA

Figure 4.14.1

roads occur within the area of the Project (Figure 4.14.1).

4.14.2.2.3 Public Safety

The study area includes highways and road facilities that could reasonably be assumed to be used or needed for the transportation of hazardous materials to the Project Area. The affected environment for hazardous materials include air, water, soil, and biological resources that could be potentially affected by an accidental release of hazardous materials during transportation to and from the Project Area, and during storage and use within the Project Area.

As described in Section 2.6.7 and Table 2.6.2, current mining and ore processing operations involve the transportation, use, and storage of the following materials classified as hazardous: (a) diesel fuel, gasoline, oils, greases, anti-freeze, and solvents used for equipment operation and maintenance; (b) sodium cyanide, sodium hydroxide, nitric acid, sulfuric acid, hydrochloric acid, flocculants, and anti-scalants used in the gold extraction processes; and (c) ammonium nitrate and other explosive agents used for blasting in the open pit.

Minor spills of petroleum products have occurred at existing facilities. Spills of diesel fuel have occurred during equipment fueling procedures or during the filling of diesel fuel storage tanks. Other releases of various types of petroleum products, such as hydraulic fluid, have occurred as a result of mining equipment or machinery failure. All spills have been cleaned up immediately in accordance with the Spill Prevention, Control and Countermeasures Plan (SPCCP) prepared for CGM's existing facilities and in accordance with federal and state regulations.

The entire Project Area is currently subject to drilling activities associated with mineral exploration. Hazardous materials currently used in conjunction with exploration activities to operate and maintain equipment, include petroleum motor fuels and lubricants, antifreeze and solvents. The hazardous materials are brought to the exploration site in small amounts for daily consumption.

4.14.3 Environmental Consequences and Mitigation Measures

4.14.3.1 Significance Criteria

The criteria used to evaluate the significance of potential impacts to land use, access, and public safety will be similar to the criteria used in the Pipeline project FEIS (BLM 1996a; page 4-61). The Proposed Action would normally have a significant effect on the environment if the following would occur:

4.14.3.1.1 Land Use

- Result in the substantial termination or modification of a land use;
- Conflict with adopted environmental plans and goals of the community where it is located; or
- Disrupt or divide the physical arrangement of an established community.

4.14.3.1.2 Access

- Cause an increase in traffic which is substantial in relation to the existing traffic load and capacity of the roadway system; or
- Prevent or substantially reduce public access through the elimination of existing routes of travel.

4.14.3.1.3 Public Safety

- Create a potential public health hazard or involve the use, production, or disposal of materials which pose a hazard to people, animals, or plant populations; or
- Interfere with emergency response plans or emergency evacuation plans.

4.14.3.2 Assessment Methodology

The Proposed Action and alternatives are compared with existing land uses and land use plans to determine if they would adversely affect these land uses or conflict with existing land use plans. To evaluate impacts to access, the Proposed Action and alternatives are reviewed against existing conditions and local transportation plans. Environmental consequences related to public safety are evaluated by reviewing relevant state and federal guidelines for public safety and the proposed Project processes and operations. It

is assumed that the Proposed Action and alternatives would comply with all applicable county, state, and federal regulations with relevant public safety implications. The significance criteria are then applied to determine if the adverse effects would be considered significant impacts if the Project or an alternative were implemented.

4.14.3.3 Proposed Action

4.14.3.3.1 Environmental Consequences and Mitigation Measures

Land Use

Short-term and Long-term Loss of Public Lands

Construction and operation of the Project would directly affect land use through the loss of public lands managed for multiple uses in areas subject to surface disturbance. The locations of the proposed disturbance are identified on Figure 3.1.1, and the surface acreage by mine facility component is identified in Table 3.1.1. The area disturbed would be temporarily unavailable for current land uses, which consist primarily of livestock grazing and mineral exploration. The Proposed Action would result in the temporary loss of 352 AUMs, which represents a less than 0.1 percent loss of the Active Grazing Preference in the Carico Lake Allotment. Impacts to range resources are discussed in detail in Section 4.6.3. As described in Section 3.9, CGM would reclaim the Project Area to provide a post-mining surface condition that would be consistent with the expected long-term land uses: wildlife habitat, livestock grazing, and possible future mining-related activities.

The South Pipeline open pit would not be reclaimed to the pre-mining land use. Following the cessation of mining and pit dewatering, ground water would be allowed to enter and accumulate within the open pit, forming an artificial lake. The BLM has no plans to develop this water-filled pit for recreational purposes. As described in the Proposed Action, to insure public safety and prevent vehicular, livestock, and wildlife (most species) access, reclamation of the open pit would include construction of a physical perimeter barricade. The open pit would result in a nominal long-term loss of the Active Grazing Preference in the Carico Lake Allotment (see Section 4.6.3). The Partial Backfill, Injection, and Water Delivery to Private Land options do not otherwise impact land use.

▣ **Impact 4.14.3.3.1-1:** Public lands currently utilized for livestock grazing and mineral exploration would be removed from use as a result of the construction and operation of the Project. The Proposed Action would result in an additional 4,450 acres of disturbance over and above the currently approved mining-related activities. Reclamation would be completed for 3,845 acres, or 86 percent, of the disturbed area (Section 3.9). Approximately 605 acres of public land in the vicinity of the open pit would not be reclaimed to the pre-mining land use.

Significance of the Impact: This impact is considered less than significant and no mitigation measures are required.

Impacts to Land Use Authorizations

The Proposed Action would not result in any impacts or changes to land ownership within the Project Area. As described in the Proposed Action, the Project would result in some changes to existing ROWs within the Project Area. CGM would abandon the existing ROW for a portion of the Gold Acres Haul Road between Gold Acres (N-7803) and Lander County Road 225 and would construct temporary mine roads in its place. A portion of the Cortez Mine Road ROW would be rerouted to the east, around the tailings facility expansion, to connect with SR 306. The rerouted section would be 10,500 feet in length and would disturb 37 acres (included in the 4,450 acres discussed above). The rerouted section would not be reclaimed following mining and would remain open for public use and access. Transmission lines that supply power to the Pipeline facilities would be extended to serve Project facilities. A ROW would be required for the conveyance of water across public land and onto private land owned by CGM. The existing system of open channels and pipelines (N64-81-001P) would serve the dual purpose of delivering dewatering water to infiltration sites and to CGM's Dean Ranch and other CGM-owned private parcels (e.g. Frome parcel, Filippini parcel, McCoy parcel). As existing ROWs or portions of existing ROWs would be eliminated by the development of mine facilities, BLM would be notified and those ROWs or portions of ROWs would be relinquished by CGM. The BLM would subsequently amend the ROW grants, as required.

The Proposed Action would not conflict with land use plans and regulations currently in place to guide development in Lander County. These plans and regulations include the following: the Lander County

Master Plan, Lander County Policy Plan for Public Lands, Lander County Zoning Regulations, and the BLM's Shoshone-Eureka RMP. CGM's use of public lands under the Proposed Action is reasonably incident under the BLM's occupancy regulations at 43 CFR 3715.

Access

Because SR 305 is the main north-south corridor through Lander County (connecting Battle Mountain and Austin), the primary reason that the public may utilize SR 306, Lander County Road 225, and Lander County Road 108B in the vicinity of the Project Area would be to access dispersed recreational areas. The public may access the historic Cortez structures by traveling through the Project Area, or access areas south of the Project Area, such as the Carico Lake Valley or the Cedars, for OHV use or hunting. Public access routes to areas near and beyond the Project Area would not be impacted by the Proposed Action. Public access would remain available throughout the construction, mining, and reclamation phases of the Project. The Project would only increase the duration of mining activity in the Project Area beyond the time frame approved for the Pipeline project and would not employ a significant amount of additional personnel or a significant amount of production equipment which would add traffic pressure to existing routes; however, as shown on Table 3.6.2, the Project would cause additional deliveries of some hazardous chemicals to the Project Area. The Proposed Action may also require up to 50 contractors traveling to the site at any time during the life of the Project.

Overall, the impact of the Proposed Action on increasing traffic on existing roadways is not considered significant. All other haul and access roads constructed by CGM under the Proposed Action would be reclaimed following the completion of mining. The Partial Backfill, Injection, and Water Delivery to Private Land options do not otherwise impact access.

Public Safety

The Proposed Action affects public safety primarily through the use of chemicals on site, some of which may be classified as hazardous, and the transport of those chemicals to and from the Project Area on public roads. The impacts of hazardous materials use and transport are discussed fully below. The hazard of a rangeland fire in the Project Area may be slightly increased as a result of the Proposed Action; however, CGM has an extensive fire suppression system in place for existing facilities which would be adequate to protect additional facilities constructed under the Proposed Action.

The Proposed Action would involve the transportation, handling, storage, use, and disposal of hazardous materials in quantities equivalent to, and in some cases higher than, the quantities currently approved for the Pipeline project. Hazardous materials and amounts used under the Proposed Action are shown in Table 3.6.2. Trucks would be used to transport hazardous materials to the Project Area from Elko (located approximately 78 miles from the Project Area). It is assumed that the transportation route would be west from Elko on I-80 to the Beowawe exit (approximately 40 miles), then south on SR 306 (approximately 38 miles). The transportation route travels through the communities of Elko, Carlin, Beowawe, and Crescent Valley.

The environmental effects of a release would depend on the substance, quantity, timing, and location of the release. The event could range from a minor oil spill at the Project Area where cleanup equipment would be readily available, to a severe spill during transportation involving a large release of sodium cyanide. Some of the chemicals could have immediate adverse effects on water quality and aquatic resources if spills were to enter streams. Spills of hazardous materials could seep into the ground and contaminate ground water resources. Depending on the proximity of people to such spills or the use of degraded water for human consumption, an accidental spill could affect human health.

Transportation Impacts

Based on the quantity of material used and number of deliveries, the hazardous materials of greatest concern under the Proposed Action are diesel fuel and sodium cyanide. Diesel fuel would be delivered to the Project Area in tanker trucks with an 11,000-gallon capacity. Sodium cyanide would be shipped as a liquid in 18,000-pound tanker trucks. Based on the capacity of the delivery vehicles, the Project Area would receive approximately 396 tanker deliveries of diesel fuel and 128 tanker deliveries of sodium cyanide annually. Assuming the life of the Project is 18 years, the total number of deliveries of diesel fuel and sodium cyanide would be 7,128 and 2,304, respectively, over the duration of the Proposed Action.

The probability of an accident (i.e., release) occurring during transportation of the two substances was

calculated using the Federal Highway Administration truck accident statistics (Rhyne 1994). According to these statistics, the average rate of truck accidents for rural two-lane roads is 2.19 accidents per million miles traveled. The average rate of truck accidents for freeways is 0.64 accidents per million miles traveled. Approximately 40 miles of freeway would be traveled from Elko to the Beowawe exit, and approximately 38 miles of two-lane rural road would be traveled from Beowawe to the Project Area.

The probability of a spill or release was based on accident statistics for liquid tankers carrying hazardous materials (Harwood and Russell 1990). These statistics indicate that, on average, 18.8 percent of accidents involving liquid tankers carrying hazardous materials resulted in a spill or release. The probability of a spill resulting from a truck carrying diesel fuel or sodium cyanide is calculated in Table 4.14.3. The probability analysis indicates that the potential for an accidental hazardous materials release is low. The calculated probability of a spill along the entire truck route for the life of the Project is approximately 15 in 100 trips for diesel fuel for the total miles traveled under the Proposed Action and 5 in 100 for sodium cyanide.

Storage and Use Impacts

Over the life of the project, the probability of minor spills of materials such as oils and lubricants would be relatively high. These releases could occur as a result of a bad connection on an oil supply line or an equipment failure. Spills of this nature would be localized, contained, and appropriately cleaned up and disposed of at an authorized facility. CGM would have the necessary spill containment and cleanup equipment available on-site, and personnel would be able to respond quickly. The design of the leaching operations and hazardous materials storage facilities would minimize the potential for an upset that results in a major spill. Process systems are designed so that any solution spill drains to a collection area where spillage can return to the system and are also designed to prevent spills during extreme storm events. Stored chemicals are protected from the elements. Petroleum fuels are stored in above-ground tanks and surrounded with a containment structure to accommodate at least 110 percent of the volume of the largest tank within the containment area. Most of the storage tanks are double-walled. An additional chemical storage facility would be created for the Project at the new heap leach facility.

All hazardous materials would be handled in accordance with applicable MSHA regulations. The hazardous substances to be used for the Proposed Action would be handled as recommended in the manufacturer's Material Safety Data Sheet (MSDS). With the proposed design features and operational practices in place, the probability of a release occurring at the mill or leaching sites, or chemical storage areas, would not be significant.

Effects of a Release

The environmental effects of a release would depend on the material released, the quantity released, and the location. Potential effects of the two chemicals of concern, diesel fuel and sodium cyanide, are described below.

A direct release of diesel fuel could kill vegetation if contact continues for an extended period. Although extremely unlikely, a diesel fuel spill could ignite a rangeland fire. A direct release into a water body could contaminate water and sediments, possibly impacting local aquatic populations. However, due to the anticipated rapid response and cleanup of a diesel fuel spill, long-term increases of hydrocarbons in soils, surface water, or ground water are not expected to result.

The effects of a sodium cyanide release would vary greatly depending on the amount and concentration released, location of the release (dry hillside, wetland, or flowing stream), the organisms exposed, and the chemical condition at the release location. The most likely effect of a sodium cyanide release would be immediate poisoning. Animal species that could potentially drink cyanide-contaminated water could suffer severe effects or death, depending on the concentrations and volume ingested. Sodium cyanide released to the atmosphere decomposes rapidly into hydrogen cyanide gas which is poisonous and flammable at high concentrations. Animals which may inhale sodium cyanide could suffer severe effects or death, depending on the concentration and duration of the exposure. Animals which survived an exposure to sodium cyanide would recover rapidly due to the natural detoxification process within the body that removes the contaminants. The environmental effects of a cyanide spill or leak would also be limited by the extent and time of contamination due to the rapid degradation of cyanide into non-toxic compounds when exposed to direct sunlight or oxygen.

A large-scale release of a hazardous material could have implications for public health and safety. However, the probability of a release anywhere along

Table 4.14.3: Estimated Number of Spills Resulting from Truck Accidents Under the Proposed Action

Substance	Total Tanker Deliveries	Haul Distance	Accident Rate per Million Miles Traveled[a]	Calculated Number of Accidents	Probability of Release Given an Accident[b]	Calculated Number of Spills
Rural Freeway						
Diesel Fuel	7,128	40	0.64	0.18	18.8%	0.03
Sodium Cyanide	2,304	40	0.64	0.06	18.8%	0.01
Rural Two-Lane Road						
Diesel Fuel	7,128	38	2.19	0.59	18.8%	0.11
Sodium Cyanide	2,304	38	2.19	0.19	18.8%	0.04
Total Estimated Releases - Diesel Fuel (Freeway + Two-Lane Road)						0.15
Total Estimated Releases - Sodium Cyanide (Freeway + Two-Lane Road)						0.05

[a] Accident rates are based on the average number of truck accidents occurring per million road miles traveled by road types.
[b] Spill probabilities are based on statistics from accident reports that indicate the percentage of truck accidents involving liquid tankers that resulted in spills.

Source: Harwood and Russell 1990; Rhyne 1994.

a transportation route was calculated to be low, and the probability of a release within a populated area or that would cause an injury or fatality would be lower still. A release involving severe effects to human health or safety is not expected to occur during the life of the Project. In addition, none of the process chemicals used or fuels used in large quantities are carcinogenic; therefore, no increases in cancer risk as a result of a release or Project processing activities are expected.

Response to a Release

In the event of an off-site release during transport, the transportation company would be responsible for first response and cleanup. Each transportation company would develop a SPCCP, or equivalent, to address the materials they would be transporting. Local and regional law enforcement and fire protection agencies may also be involved initially to secure the site and protect public safety. CGM has developed an Emergency Response Plan for advice, personnel, and equipment as appropriate to minimize the impact of an accident. In addition, the Chemical Manufacturers' Association maintains the Chemical Transportation Emergency Center, which has a 24-hour "hotline" to provide information, advice, and assistance in identification and mitigation of chemical emergency scenes.

To prevent the escape of pollutants from on-site containment facilities and to ensure subsequent cleanup as necessary for petroleum product at existing facilities, CGM has prepared an SPCCP in accordance with 40 CFR 112. In accordance with State of Nevada Regulations (NAC 445A.242 and 445A.243), CGM has also prepared a Hazardous Material Spill and Emergency Response Plan for existing facilities. The plan establishes procedures and methods to be implemented to abate and cleanup an on-site hazardous material spill. If required, spills occurring at the Project Area would be reported to the appropriate federal and state agencies. The Partial Backfill, Injection, and Water Delivery to Private Land options do not otherwise impact public safety.

▣ **Impact 4.14.3.3.1-2:** A spill of hazardous materials could adversely affect public safety and the environment.

Significance of the Impact: This impact is considered less than significant and no mitigation measures are required, but the following mitigation measure is provided to reduce the adverse effects of this potential impact.

- **Mitigation Measure 4.14.3.3.1-2:** The Project Applicant shall amend the existing SPCCP and Hazardous Material Spill and Emergency Response Plan to incorporate the Project facilities and operations.

4.14.3.3.2 Residual Adverse Impacts

The Proposed Action would result in the unavoidable loss of up to 605 acres of public lands utilized for livestock grazing and mineral exploration resulting from surface disturbance associated with the South Pipeline open pit. There would be no residual adverse impact to access resulting from the Proposed Action. The Proposed Action would have the unavoidable indirect potential to adversely affect employee and/or public safety through the accidental spill or release of hazardous materials either during transport to the Project Area, or from activities within the Project Area. However, due to the low probability of a significant accidental hazardous materials spill or release, the unavoidable potential impact is considered less than significant.

4.14.3.4 Pipeline Backfill Alternative

Impacts to land use, access, and public safety from the Pipeline Backfill Alternative are generally the same as those described for the Proposed Action. The differences between the Proposed Action and the Pipeline Backfill Alternative that relate to impacts on land use are that the alternative would result in less (605 acres) surface disturbance in the area of the South Pipeline waste rock dump than the Proposed Action, and the Pipeline open pit would be reclaimed following backfilling (276 acres).

4.14.3.4.1 Environmental Consequences and Mitigation Measures

Impacts to land use authorizations, access, and public safety are the same as those described for the Proposed Action (Section 4.14.3.3.1) and are herein incorporated by reference.

Short- and Long-term Loss of Public Lands

Construction and operation of the Project would directly affect land use through loss of public lands managed for multiple uses in areas subject to surface disturbance. The locations of the proposed disturbance are identified on Figure 3.1.1, and the surface acreage by mine facility component is identified in Table 3.1.1. Generally, the impacts to public lands described under this subsection for the Proposed Action apply to the Pipeline Backfill Alternative.

- **Impact 4.14.3.4.1-1:** Public lands currently utilized for livestock grazing and mineral exploration would be removed from use as a result of the construction and operation of the Project. The Pipeline Backfill Alternative would result in an additional 3,841 acres of disturbance over and above the currently approved mining-related activities. Reclamation would be completed for 3,238 acres, or 84 percent, of the disturbed area (Section 3.9). In addition, 276 acres of approved disturbance associated with the Pipeline project would be reclaimed following backfilling of the Pipeline open pit - an area that was not able to be reclaimed under the Proposed Action or as part of the Pipeline project. Approximately 605 acres of public land in the vicinity of the South Pipeline open pit would be disturbed and not reclaimed.

  Significance of the Impact: This impact is considered less than significant and no mitigation measures are required.

4.14.3.4.2 Residual Adverse Impacts

The Pipeline Backfill Alternative would result in the unavoidable loss of up to 605 acres of public lands utilized for livestock grazing and mineral exploration resulting from surface disturbance in the open pit area. There would be no residual adverse impact to access resulting from the Pipeline Backfill Alternative. Like the Proposed Action, the Pipeline Backfill Alternative would have the unavoidable indirect potential to adversely affect employee and/or public safety through the accidental spill or release of hazardous materials either during transport to the Project Area, or from activities within the Project Area. However, due to the low probability of a significant accidental hazardous materials spill or release, this unavoidable potential effect is considered less than significant.

4.14.3.5 No Action Alternative

Under the No Action Alternative, CGM is currently authorized to disturb 3,166 acres of public land as a result of the construction and operation of the Pipeline project. Facilities and mining operations that have been approved but not yet completed would have impacts on land use, access, and public safety. Public lands managed for multiple uses within the 4,450 acres of proposed surface disturbance associated with the Proposed Action would remain undisturbed.

4.14.3.5.1 Environmental Consequences and Mitigation Measures

The impacts on land use under the No Action Alternative would be the same as those described and analyzed in the Pipeline project FEIS (BLM 1996a; pages 4-61 through 4-62). No additional public lands would be removed from multiple use management and impacts to land use would be limited to ongoing permitted mining and exploration activities. There would be no impacts to access beyond existing conditions resulting from the approved Pipeline project.

Public Safety

Transportation Impacts

As with the Proposed Action, diesel fuel and sodium cyanide are the hazardous materials of greatest concern shipped to the site for existing CGM operations. Total annual deliveries of diesel fuel would be the same for the No Action Alternative. The total number of deliveries over the life of the Pipeline project (estimated at 12 years) would be 4,752. The number of annual sodium cyanide deliveries would be lower than under the Proposed Action, 86 per year. The total number of deliveries over the duration of the Pipeline project would be 1,032. The probability of a spill was calculated using national accident statistics as described previously for the Proposed Action. The probabilities for spills resulting from trucks carrying diesel fuel or sodium cyanide are presented in Table 4.14.4. Compared to the Proposed Action, the probability analysis indicates that a lower potential for an accidental release of liquid during truck transport under the No Action Alternative. The calculated probability of a spill along the entire truck route for the life of the Pipeline project is approximately 10 in 100 for a diesel fuel spill for the total miles traveled under the Proposed Action, and 2 in 100 for a sodium cyanide spill. The potential effects of and responses to an off-site release would be the same as described under the Proposed Action.

Storage and Use Impacts

Storage and use of hazardous materials under the No Action Alternative would be similar to that described for the Proposed Action. Spill containment facilities would be in place, and all hazardous materials would be stored and handled in accordance with applicable regulations. The probability of a release occurring under existing conditions would not be significant. Effects of and response to an on-site release would be the same as described for the Proposed Action.

4.14.3.5.2 Residual Adverse Impacts

There would be no residual impacts to land use, access, and public safety under the No Action Alternative, other than those impacts caused by permitted operations at the Pipeline project. However, the Pipeline project FEIS (BLM 1996a; pages 4-63 and 4-67) provided mitigation for impacts to land use resulting from the Pipeline project and did not identify any unavoidable adverse effects to this resource. The Pipeline project FEIS did not identify any impacts to access; however, the impacts to access caused by existing operating conditions under the Pipeline project are considered temporary and no residual adverse impacts are anticipated. In the Water Resources section of the Pipeline project FEIS (BLM 1996a; page 4-31), chemical spills were identified as a potential impact to water resources. The potential impact was considered mitigated by the implementation of the SPCCP and a mitigation measure requiring treatment and/or proper disposal of contaminated soil (BLM 1996a; pages 4-38 through 4-39). The Pipeline project FEIS did not identify any unavoidable adverse effects from hazardous material spills.

4.15 Recreation and Wilderness

4.15.1 Regulatory Framework

Plans and policies applicable to the Project Area and general region include the following:

- Lander County Master Plan;
- Nevada Statewide Comprehensive Outdoor Recreation Plan (SCORP);
- BLM Shoshone-Eureka RMP; and
- Interim Management Policy for Lands Under Wilderness Review.

Table 4.14.4: Estimated Number of Hazardous Materials Spills Resulting from Truck Accidents Under the No Action Alternative

Substance	Total Tanker Deliveries	Haul Distance	Accident Rate per Million Miles Traveled[a]	Calculated Number of Accidents	Probability of Release Given an Accident[b]	Calculated Number of Spills
Rural Freeway						
Diesel Fuel	4,752	40	0.64	0.12	18.8%	0.02
Sodium Cyanide	1,032	40	0.64	0.03	18.8%	0.00
Rural Two-Lane Road						
Diesel Fuel	4,752	38	2.19	0.40	18.8%	0.07
Sodium Cyanide	1,032	38	2.19	0.09	18.8%	0.02
Total Estimated Releases - Diesel Fuel (Freeway + Two-Lane Road)						0.10
Total Estimated Releases - Sodium Cyanide (Freeway + Two-Lane Road)						0.02

[a] Accident rates are based on the average number of truck accidents occurring per million road miles traveled by road types.
[b] Spill probabilities are based on statistics from accident reports that indicate the percentage of truck accidents involving liquid tankers that resulted in spills.

Source: Harwood and Russell 1990; Rhyne 1994.

The state-mandated Lander County Master Plan (Master Plan) attempts to evaluate the limitations and availability of county resources and how they can best be balanced to guarantee a healthy and viable environment (County of Lander 1994). The Recreation Element of the Master Plan describes current recreational opportunities within the county and establishes the following recreation goals:

- Provide adequate recreation facilities for Lander County and its residents;
- Maintain and improve access to outdoor recreational resources; and
- Develop and improve outdoor recreation facilities in Lander County consistent with the goal of the Lander County Plan for the Management of Public Lands (see Section 4.14.2.2.1).

The Nevada Statewide Comprehensive Outdoor Recreation Plan (SCORP) defines outdoor recreation, conservation, and open space needs for the state and provides a comprehensive description of statewide recreational issues and strategies to guide federal, local, and private recreation suppliers (Nevada Division of State Parks 1992). Completion of the SCORP is required for the state to maintain eligibility for federal financial assistance through the Land and Water Conservation Fund Program, created by Congress through the Land and Water Conservation Fund Act of 1965. The SCORP, last updated in 1992, is typically updated at least once every five years. However, this deadline has been extended and the SCORP will not be updated again until 1999 (Personal communication, Linda Eissman, Nevada Division of State Parks, August 27, 1997).

The Project Area is located primarily on public land within the Shoshone-Eureka Resource Area administered by the BLM's Battle Mountain Field Office. Recreation policies within this Resource Area are guided by the Shoshone-Eureka RMP. The Project Area is located on lands designated for multiple use.

The BLM's Interim Management Policy for Lands Under Wilderness Review guides management decisions made for specific areas of public lands under wilderness review by Congress. The policy applies to the following: (a) Wilderness Study Areas (WSAs) identified by the wilderness review required by Section 603 of the FLPMA; (b) WSAs established by Congress; and (c) WSAs identified through the land use planning process in Section 202 of FLPMA. The purpose of the policy is to prevent impairment of the wilderness values of WSAs under BLM's jurisdiction until such time Congress either designates the area as wilderness or releases it from the wilderness review process through legislation. None of the plans or policies discussed above contain specific information related to the Project Area.

4.15.2 Affected Environment

4.15.2.1 Study Methods

The baseline data presented below is based upon information from the Pipeline project FEIS (BLM 1996a; pages 3-41 through 3-43) and its precursor, the Cortez Gold Mine Expansion Project DEIS (BLM 1992; pages 3-42 through 3-45). Discussions of existing recreational opportunities, including developed facilities, dispersed uses, designated wilderness, and WSAs, are incorporated by reference. New and supplemental information obtained from more recent public agency maps and reports, and from telephone communications with federal, state, county, and community officials have been added.

The study area for recreation and wilderness includes the Project Area, as well as portions of Elko, Eureka, Humboldt, Lander, and Pershing Counties (SCORP planning regions IV; V; and VI, Nevada Division of State Parks 1992). As discussed in the Pipeline project FEIS, this study area was defined based on the fact that employees may live up to 70 miles from the Project Area, with approximately 55 percent living in the Elko/Spring Creek area, 21 percent in Crescent Valley and Beowawe, 14 percent in Battle Mountain, and 11 percent in Carlin (Section 3.6.2). Because developed recreational opportunities are relatively sparse in this part of Nevada, it is assumed that users would travel to remote areas of the general region, particularly on weekends, to recreate.

4.15.2.2 Existing Conditions

4.15.2.2.1 Recreation

Dispersed outdoor recreation is the predominant type of recreation within the Project Area and surrounding region. Primary dispersed recreational uses in the vicinity of the Project Area, described in the Pipeline project FEIS, include: hunting, hiking, and camping in nearby WSAs; photography (especially of historic Cortez structures); OHV use; and rock hounding (BLM 1996a; page 3-42). Other dispersed uses which may occur in the various mountain ranges in the general region include backpacking, horseback riding, mountain biking, back country and cross-country skiing, snowmobiling, picnicking, and sightseeing. There are no off-road vehicle use restrictions within the BLM Battle Mountain Field Office except within WSAs where motor vehicle use is limited to existing travel routes (BLM 1983).

There are a variety of hunting opportunities in the general region. Common species hunted include mule deer, antelope, mountain lion, sage grouse, chukar, cottontail rabbit, quail, pigeon, dove, and waterfowl. NDOW regulates big game hunting through a quota system. Statewide, the number of deer tags sold by NDOW during 1996 increased 24 percent from 1995 sales. However, deer tag sales remained 11 percent below the annual average documented from 1976 to 1995 due to lower quotas that have resulted from deer population declines during the early 1990s. During the 1996 hunting season, hunters experienced a higher average success rate than the long-term average, 46 percent compared with 29 percent (NDOW 1997c).

Hunting for mule deer is the predominant hunting activity in the vicinity of the Project Area. The Project Area is located within NDOW Management Areas 14 (unit 141) and 15 (units 152 and 154). Management Area 14 had a buck quota increase in 1996 due to good recruitment (i.e., fawn survival rate) and a population estimate increase. The general hunter success rate for the area dropped from 54 percent in 1995 to 48 percent in 1996. NDOW expects the 1997 quota recommendation for Area 14 to be lower in 1997 due to an overestimation of the 1996 population and a low observed buck ratio (bucks to does). The Management Area 15 buck quota also had an increase in 1996 above the 1995 quota level. During 1996, the hunter success rate in Management Area 15 was higher than anticipated. NDOW expects the area's 1997 season quota to be similar or slightly higher than the 1996 quota (NDOW 1997c).

Developed recreation areas in the general region are depicted on Figure 4.15.1. The figure displays the locations of federal, state, and county developed recreation facilities. There are no developed facilities within or near the Project Area. The 1987 SCORP compares favorite recreational activities with actual participation in those activities by planning region. For planning regions IV, V, and VI, study participants listed lake fishing, game hunting, camping, horseback riding, and golf among their favorite activities; however, actual participation in these activities, for a variety of reasons, was substantially less than the desire to participate would indicate (Nevada Division of State Parks 1987). As described in the Pipeline project FEIS, the demand for recreational facilities by residents of the three planning regions is projected to exceed the supply by 2000, particularly as residents of more populated areas of the state and out-of-state residents increase their use of the region's facilities (BLM 1996a; page 3-43). Specifically, the following recreation shortfalls have occurred or are estimated to occur by 2000 in each region for the following recreational facility types:

- Region IV - stream fishing, cross-country and downhill skiing, tennis courts;
- Region V - stream fishing, cross-country and downhill skiing, bike trails, hiking and backpacking trails, ball fields, and tennis courts; and
- Region VI - stream fishing, cross-country and downhill skiing, bike trails, tent camping sites, picnic spots, ball fields, and tennis courts (Nevada Division of State Parks 1987).

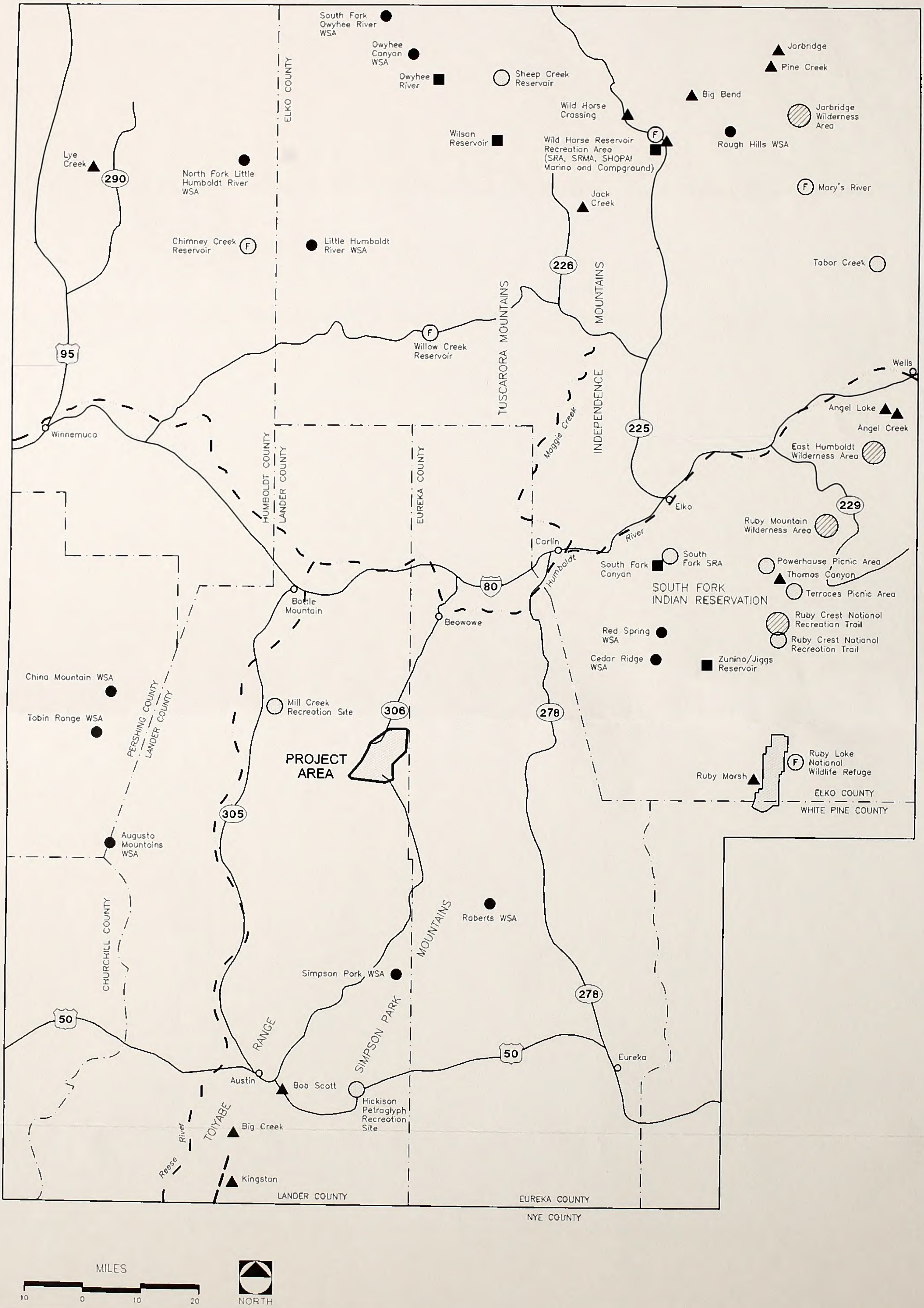
As discussed in the Pipeline project FEIS, the above supply and demand data was gathered in surveys conducted over 10 years ago, before much of the recent mining activity in the region began. Because of this, the demand figures may be low and the focus of recreational pursuits may have changed (BLM 1996a; page 3-43).

As described in Section 2.6.2, the majority of CGM employees live in the Elko/Spring Creek area. Recreational facilities in the City of Elko include seven parks which provide picnic areas; tennis, basketball, and volleyball courts; ball fields; football and soccer fields; playgrounds; a hockey roller rink, and a municipal pool (Personal communication, Dawn Leyva, City of Elko Parks and Recreation, September 24, 1997). Elko also has a public golf course, archery range, speedway, firearms range, and trap and skeet range (BLM 1992; page 3-43). The City of Elko is currently completing a new soccer complex. According to the Recreation Director, demand for new park and recreation facilities is high due to the significant population growth experienced by Elko in recent years (Personal communication, Dawn Leyva, City of Elko Parks and Recreation, September 24, 1997).

CGM employees also live in Carlin, Battle Mountain, Crescent Valley, and Beowawe. The City of Carlin has a 9-acre park which includes ball fields; batting cages; tennis, volleyball, and basketball courts; and a football/soccer field. The Chinese Garden Nature Study Area, featuring 15 acres of interpretive trails, is also located in Carlin. The community is currently seeking funding to construct a community center to meet the growing demand for youth recreation (Personal communication, Beth Brown, Carlin City Hall, September 23, 1997). The City of Battle Mountain has four public parks, ball fields, a municipal pool, and a public golf course. The City will be constructing a sports complex beginning in 1998 (Personal communication, Debbie Anderson, City of Battle Mountain Parks and Recreation, September 24, 1997). The Town of Crescent Valley has one park which provides basketball and tennis courts, picnic areas, a ball field, and playground. Beowawe does not possess any developed recreational facilities (Personal communication, Vicki Drennon, Crescent Valley Town, September 24, 1997).

4.15.2.2.2 Wilderness

The Wilderness Act of 1964 established the National Wilderness Preservation System which is comprised of public and other federal lands designated by Congress as wilderness. No designated wilderness areas or WSAs exist within 10 miles of the Project Area. The closest designated wilderness is the Ruby Mountain Wilderness, located in the Humboldt National Forest approximately 70 miles to the northeast. This wilderness is approximately 90,000 acres in size and is administered by the USFS. As discussed in the Cortez Gold Mine Expansion Project DEIS, the nearest WSA is the Roberts Mountains WSA, located in central Eureka County, approximately 18 miles southeast of the Project Area. This WSA, administered by the BLM, is approximately 15,000 acres in size and offers numerous opportunities for secluded primitive and unconfined recreation (BLM 1992; page 3-44). There are 12 WSAs located in the general region of the Project Area which are depicted on Figure 4.15.1.



EXPLANATION

- ▲ PUBLIC CAMPGROUND
- ○ RECREATION AREA/SITE
- Ⓕ FISHING AREA
- ● WILDERNESS STUDY AREA (WSA)
- WILDERNESS AREA
- ■ SPECIAL RECREATION MANAGEMENT AREA (SRMA)
- TOIYABE CREST NATIONAL RECREATION TRAIL
- RIVERS, STREAMS, CREEKS

File: 1298-4151-IGG
Date: 5/18/99
Reviewed By: KK & RD

RECREATION AND WILDERNESS AREAS

Figure 4.15.1

SOUTH PIPELINE PROJECT EIS

4.15.3 Environmental Consequences and Mitigation Measures

4.15.3.1 Significance Criteria

The Proposed Action would normally have a significant effect on the environment if the following would occur:

- Conflict with established recreational, educational, religious, or scientific uses of the area;
- Result in nonconformance with the Wilderness Act of 1964 or the BLM Interim Wilderness Management Policy;
- Substantially degrade or reduce the quantity or quality of the area available for existing or future recreational opportunities; or
- Result in the unmitigated loss of a unique recreational resource.

4.15.3.2 Assessment Methodology

The Proposed Action and alternatives were compared to the recreational planning information obtained from Lander County, NDSP, and BLM to determine the potential for, and expected severity of, conflicts with existing and planned recreational uses. Potential effects on recreational resources can be categorized as short-term (i.e., during the life of the Project) and long-term. Short-term loss of recreation would occur in areas subject to surface disturbance and subsequent reclamation. Long-term loss of recreation would occur in areas that would not be reclaimed (i.e., pits that are not backfilled). The effects are determined to be significant or not significant based on the applicable significance criteria listed in Section 4.15.3.1.

4.15.3.3 Proposed Action

4.15.3.3.1 Environmental Consequences and Mitigation Measures

Short- and Long-term Loss of Public Lands

Construction and operation of the Project would directly affect recreation through loss of public lands managed for multiple uses, including dispersed recreation, in areas subject to surface disturbance. The locations of the proposed disturbance are identified on Figure 3.1.1, and the surface acreage by mine facility component is identified in Table 3.1.1. The additional acreage of disturbance would not be available for dispersed recreation during mining and reclamation. However, the proposed area of disturbance is not intensively used for recreational activity since it is used for mineral exploration and is located adjacent to existing mining operations. The Project Area does not offer unique recreational opportunities not found elsewhere in the vicinity. Public access to the immediate area could be restricted for safety and security reasons. This area would be reopened to the public as soon as the mine poses no safety risk following reclamation. The restoration of recreational opportunities within the Project Area would depend on both the successful reclamation of the land, and the status of other mining activities that may exist at that time. Large areas of open land outside the Project Area, but within the BLM's Battle Mountain Field Office, are available for dispersed recreation. The impacts of the Proposed Action on access to public lands near the Project Area used for dispersed recreation are discussed in Section 4.14.3.3.1.

The South Pipeline open pit would not be reclaimed to the pre-mining land use. Following the cessation of mining and pit dewatering, ground water would be allowed to enter and accumulate within the pit, forming an artificial lake. The BLM has no plans to develop this water-filled pit for recreational purposes. As described in the Proposed Action, to insure public safety and prevent vehicular, livestock, and wildlife (most species) access, reclamation of the open pit would include construction of a physical perimeter barricade. The Partial Backfill, Injection, and Water Delivery to Private Land options do not otherwise impact recreation and wilderness.

▣ **Impact 4.15.3.3.1-1:** Public lands potentially used for dispersed recreation would be removed from use as a result of the construction and operation of the Project. The Proposed Action would result in an additional 4,450 acres of disturbance over and above the currently approved mining-related activities. Reclamation would be completed for 3,845 acres, or 86 percent, of the disturbed area (Section 3.9). Approximately 605 acres of public land in the vicinity of the open pit would be disturbed and not reclaimed.

Significance of the Impact: This impact is considered less than significant and no mitigation measures are required.

Demand for Recreational Facilities

Because CGM does not anticipate an increase in either temporary or permanent employment resulting from the Proposed Action, no additional pressures on developed or undeveloped recreational resources, beyond those analyzed in the Pipeline project FEIS (BLM 1996a; pages 4-48 through 4-49), are expected.

Impacts to Wilderness Resources

The Proposed Action would have no direct impact on wilderness areas or WSAs. The Proposed Action conforms with the Wilderness Act of 1964 and the BLM Interim Wilderness Management Policy.

4.15.3.3.2 Residual Adverse Impacts

The Proposed Action would result in the unavoidable loss of up to 605 acres of public land managed for multiple uses, including dispersed recreation, resulting from surface disturbance associated with the South Pipeline open pit. There would be no residual adverse impacts on wilderness areas, WSAs, or developed recreation sites.

4.15.3.4 Pipeline Backfill Alternative

Impacts to recreation and wilderness from the Backfill Alternative are generally the same as those described for the Proposed Action. The differences between the Proposed Action and the Backfill Alternative that relate to impacts on recreation are that the alternative would result in less (486 acres) surface disturbance in the area of the South Pipeline waste rock dump than the Proposed Action, and the Pipeline open pit would be reclaimed following backfilling (276 acres).

4.15.3.4.1 Environmental Consequences and Mitigation Measures

Impacts to recreation from changes in demand for recreational facilities and effects on wilderness resources are the same as those described for the Proposed Action (Section 4.15.3.3.1) and are herein incorporated by reference.

Construction and operation of the Pipeline Backfill Alternative would directly affect recreation through loss of public lands managed for multiple uses, including dispersed recreation, in areas subject to surface disturbance. The locations of the proposed disturbance are identified on Figure 3.1.1, and the surface acreage by mine facility component is identified in Table 3.1.1. Generally, the impacts to recreation resources described under this subsection for the Proposed Action apply to the Pipeline Backfill Alternative.

- **Impact 4.15.3.4.1-1:** Public lands potentially used for dispersed recreation would be removed from use as a result of the construction and operation of the Project. The Pipeline Backfill Alternative would result in an additional 3,841 acres of disturbance over and above the currently approved mining-related activities. Reclamation would be completed for 3,238 acres, or 84 percent, of the disturbed area (Section 3.9). In addition, 276 acres of approved disturbance associated with the Pipeline project would be reclaimed following backfilling of the Pipeline open pit - an area that was not able to be reclaimed under the Proposed Action or as part of the Pipeline project. Approximately 605 acres of public land in the vicinity of the South Pipeline open pit would be disturbed and not reclaimed.

  Significance of the Impact: This impact is considered less than significant and no mitigation measures are required.

4.15.3.4.2 Residual Adverse Impacts

The Pipeline Backfill Alternative would result in the unavoidable loss of up to 605 acres of public land managed for multiple uses, including dispersed recreation, resulting from surface disturbance in the open pit area.

4.15.3.5 No Action Alternative

Under the No Action Alternative, CGM is currently authorized to disturb 3,166 acres of public land as a result of the construction and operation of the Pipeline project. Facilities and mining operations that have been approved but not yet completed would have impacts on dispersed recreational uses. Public lands managed for multiple uses, including dispersed recreation, within the 4,450 acres of proposed surface disturbance associated with the Proposed Action would remain undisturbed.

4.15.3.5.1 Environmental Consequences and Mitigation Measures

The impacts on recreation and wilderness under the No Action Alternative would be the same as those described and analyzed in the Pipeline project FEIS (BLM 1996a; pages 4-48 through 4-49). No additional

public lands would be removed from multiple use management and impacts to recreation and wilderness would be limited to ongoing permitted mining and exploration activities.

4.15.3.5.2 Residual Adverse Impacts

There would be no residual impacts to recreation and wilderness under the No Action Alternative, other than those impacts caused by permitted operations at the Pipeline project. However, the Pipeline project FEIS (BLM 1996a; pages 4-49 and 4-67) provided mitigation for all impacts to recreation and wilderness resulting from the Pipeline project and did not identify any unavoidable adverse effects to these resources.

4.16 Socioeconomic Values and Public Services

4.16.1 Regulatory Framework

The following three sections list documents that have been reviewed for regulations, goals, policies, and objectives involving socioeconomic and public service issues in the study area.

4.16.1.1 Elko County

- Elko County General Plan (County of Elko 1971);
- City of Elko General Plan - Population Element (City of Elko undated);
- Carlin General Plan - Economy, Population, and Public Facilities and Services Elements (City of Carlin 1991); and
- Draft Elko County Economic Development Plan (Board of Elko County Commissioners 1997).

4.16.1.2 Eureka County

- Eureka County Master Plan - Growth Management, Economic Development, and Public Facilities and Services Elements (County of Eureka 1997);
- Eureka County General Plan - Population, Housing, Economic and Community Facilities Elements (County of Eureka undated); and
- Overall Economic Development Plan for Eureka County (County of Eureka 1995).

4.16.1.3 Lander County

- Lander County Master Plan - Population, Housing, Economics, and Public Facilities and Services Elements (County of Lander 1994); and
- Overall Economic Development Plan for Lander County (Tri-County Development Authority 1997).

4.16.2 Affected Environment

4.16.2.1 Study Methods

The baseline data presented below is based upon information from the Pipeline Project FEIS (BLM 1996a; pages 3-45 through 3-52) and its precursor, the Cortez Gold Mine Expansion Project DEIS (BLM 1992; pages 3-47 through 3-51). Discussions of existing socioeconomic, employment, housing, public service, and public finance characteristics are incorporated by reference. New and supplemental information obtained from more recent publications and from telephone communications with federal, state, county, and local officials has been added.

Socioeconomic data were collected from a variety of state and federal sources including the 1990 U.S. Census; U.S. Department of Commerce, Bureau of Economic Affairs; Nevada State Demographer; Nevada Department of Employment, Training and Rehabilitation; and Nevada Department of Taxation. Other information was obtained at the county level, including the general plans and elements of Elko, Eureka, and Lander Counties, as well as from the Elko, Eureka, and Lander County Assessor's Offices and School Districts. After this information was assembled, the most pertinent information was summarized in the tables provided in this section. For most topics, the information collected for the study area was also collected for the State of the Nevada to provide a comparison by which to evaluate socioeconomic characteristics of the study area.

The study area for socioeconomic values and public services includes the Project Area, as well as portions of Elko, Eureka, and Lander Counties. As discussed in the Pipeline project FEIS, this study area was defined based on the fact that employees may live up to 70 miles from the Project Area, with approximately 55 percent living in the Elko/Spring Creek area, 21 percent in Crescent Valley and Beowawe, 14 percent in Battle Mountain, and 11 percent in Carlin (see Section 3.6.2).

4.16.2.2 Existing Conditions

4.16.2.2.1 Population and Demography

Population

Actual, present, and projected populations of the counties and communities within the study area and the State of Nevada are presented in Table 4.16.1. Nevada was the fastest growing state in the U.S. between 1980 and 1990, experiencing a 50 percent increase in population. The population growth rate for Nevada from 1990 to 1997 remained relatively steady, with an overall increase of 48 percent. Much of the increase in population has been the result of immigration of workers in the casino gaming, tourism, and mining industries, and an associated boom in the construction industry. Nevada's growth is projected to slow slightly during the next period (1997 to 2007), with the annual average growth rate decreasing by approximately two and one-half percent, to four and four-tenths percent per year.

As shown in Table 4.16.1, Elko County's population increased most dramatically during the 1980s compared to the remainder of the study area, rising 94 percent from 17,269 to 33,530 residents. Elko County's average annual growth rate was nearly twice that of the state and far surpassed the other study area counties. This growth is attributable primarily to the discovery and mining of gold deposits along the Carlin Trend, and the subsequent influx of workers associated with mining and mining-related industries. Lander County's population grew by approximately 54 percent during the 1980s, from 4,076 to 6,266 residents. Lander County's average annual growth rate mirrored the state average and was the second highest rate among the study area counties. Eureka County's population increased the least from 1980 to 1990 - a 29 percent increase from 1,198 to 1,547 residents. Growth in each county slowed significantly during the 1990 to 1997 period. Elko and Lander Counties showed the largest decrease in annual average growth rate, both dipping below the state average for the period. Growth during the next period (1997 to 2007) is expected to be the greatest for Eureka County, steady for Lander County, and slower for Elko County compared to the previous period (1990 to 1997). Growth rates in all three counties are expected to lag behind the state average.

Carlin, Elko, and Spring Creek are the largest communities in Elko County. Combined, the three communities hosted nearly 70 percent of the population of the entire county in 1990 (see Table 4.16.1). These communities have experienced major booms in population associated with increased gold mining activities in Elko County, as well as in Eureka and Lander Counties. In addition, tourism and casino gaming expanded in Elko and surrounding areas along the Nevada-Utah and Nevada-Idaho borders. Like Elko County, these communities experienced their greatest growth during the 1980s. Average annual growth rates in Carlin and Elko fell by approximately five and two percent, respectively, during the 1990s.

Between 1990 and 1997, the population of Beowawe declined by approximately 12 percent, to 51 residents, and the population of the town of Crescent Valley declined by approximately ten percent to 240 residents (see Table 4.16.1). Unofficial estimates of the 1998 population of the town of Crescent Valley range between 500 and 600 residents, based upon the number of water meter hookups (Personal Communication - Vicki Drenon, Town Secretary, Town of Crescent Valley, March 25, 1998). The discrepancy between the 1997 and 1998 population estimates may be due to errors in the U.S. Census, differences in estimation methods, and/or the presence of non-resident workers.

Battle Mountain is home to over half of Lander County's population. The population of the central part of Battle Mountain, the Battle Mountain Census Designated Place (CDP), increased by only 28 percent from 1980 to 1990, the slowest growth of the study area communities. Growth of the Battle Mountain CDP slowed from 1990 to 1997, with the population growing by less than one percent annually (see Table 4.16.1).

There are currently 456 employees working at CGM operations. Of these, approximately 94 reside in Beowawe and the Town of Crescent Valley, 62 reside in Battle Mountain, 51 reside in Carlin, and the remaining 249 employees reside in Elko/Spring Creek. Based on the 1997 population estimates presented in Table 4.16.1, CGM employees make up nearly 32 percent of the Beowawe/Crescent Valley population, 2 percent of Battle Mountain's population, two percent of Carlin's population, and approximately one percent of the Elko/Spring Creek population (assuming Spring Creek CDP has experienced growth similar to Elko between 1990 and 1997).

Table 4.16.1: Actual, Present, and Projected Populations of the Study Area and State of Nevada

Location	Actual Population[a]		Percent Change		Present Population Estimate[b]	Percent Change		Population Projection[c]	Percent Change	
	1980	1990	1980 to 1990	Average Annual Rate	1997	1990 to 1997	Average Annual Rate	2007	1997 to 2007	Average Annual Rate
Elko County	17,269	33,530	94.2%	9.4%	47,710	42.3%	6.0%	64,060	34.3%	3.4%
Carlin	1,232	2,220	80.2%	8.0%	2,680	20.7%	3.0%	n/a	n/a	n/a
Elko	8,758	14,853	69.6%	7.0%	19,670	32.4%	4.6%	n/a	n/a	n/a
Spring Creek (CDP)[d]	n/a	5,866	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Eureka County	1,198	1,547	29.1%	2.9%	1,660	7.3%	1.0%	2,250	35.5%	3.6%
Beowawe[e]	n/a	58	n/a	n/a	51	-12.1%	-1.7%	n/a	n/a	n/a
Crescent Valley[e]	n/a	267	n/a	n/a	240	-10.1%	-1.4%	n/a	n/a	n/a
Lander County	4,076	6,266	53.7%	5.4%	7,030	12.2%	1.7%	8,120	15.5%	1.6%
Battle Mountain (CDP)[d,e]	2,749	3,542	28.8%	2.9%	3,763	6.2%	0.9%	n/a	n/a	n/a
State of Nevada	800,508	1,201,833	50.1%	5.0%	1,781,750	48.3%	6.9%	2,557,460	43.5%	4.4%

[a] U.S. Department of Commerce, Bureau of the Census, 1980 and 1990 U.S. Census, Summary Tape File 3A and 3C1 unless otherwise noted.
[b] Nevada State Demographer, Population of Nevada's Unincorporated Towns and Population of Nevada's Counties and Incorporated Cities, Final 2/24/98 unless otherwise noted.
[c] Nevada State Demographer, Population Estimates (1997) and Forecasts (1998-2018), Preliminary 3/16/98. Year 2007 projected population only available for counties.
[d] CDP = Census Designated Place.
[e] Bureau of Business and Economic Research, University of Nevada, Reno, Geodemographic Analysis - Crescent Valley, Beowawe and Battle Mountain, July 1997 Block Group Level Estimates Produced by Claritas (analysis performed at the request of EMA).

Demography

Age Distribution

Table 4.16.2 shows the age distribution of study area and State of Nevada populations as recorded during the 1990 U.S. Census. School-aged children (ages 5-17) represented 22 percent, 19 percent, and 24 percent of the populations of Elko, Eureka, and Lander Counties, respectively, compared to only 17 percent of the state population. Elko and Lander Counties also had a higher percentage of young children (ages 0-4) compared to Eureka County and the State. This trend reflects the immigration of younger households in response to increased economic opportunities in the study area during the 1980s. Elko and Lander Counties had slightly fewer, and Eureka County slightly more, adults ages 25-64 than the State. The study area counties and communities, with the exceptions of Beowawe and Crescent Valley, had significantly fewer senior citizens (age 64 and up) than the State of Nevada.

Ethnic Composition

Table 4.16.3 summarizes the ethnic characteristics of the populations in the study area. Compared to the State of Nevada, counties and communities within the study area have significantly greater percentages of White (particularly Eureka County and its communities) and American Indian, Eskimo, or Aleut persons (particularly Elko County, Lander County, and Battle Mountain) than any other ethnic group. The ethnic composition of the study area in 1990 also revealed that substantially fewer persons of Black and Asian or Pacific Islander ethnic groups were present. Elko County and Elko/Spring Creek had the highest percentage of persons of Hispanic origin in the study area.

Personal Income

According to the U.S. Department of Commerce, Bureau of Economic Affairs (BEA) Regional Facts, known as BEARFACTS, for 1986 - 1996, Nevada had a per capita personal income (PCPI) of $26,059. This PCPI ranked 10th in the U.S. and was 107 percent of the national average, $24,436. In 1986, the PCPI of Nevada was $15,713 and ranked 13th in the U.S. The average annual growth rate of PCPI over the past 10 years was five and two-tenths percent compared with the national growth rate of four and nine-tenths percent.

According to BEARFACTS for 1986 - 1996, Elko County had a PCPI of $22,582 in 1996, ranking 7th of 17 counties in Nevada. In 1986, the PCPI was $13,574 and ranked 7th in the State. The average annual growth rate of PCPI over the past 10 years was five and two-tenths percent, equivalent to the state average.

Table 4.16.4 summarizes income data for Elko County in 1989. The per capita income of $14,050 is generally consistent with BEA's PCPI income for 1986. As shown in Table 4.16.4, the per capita incomes in Elko County and its communities (with the exception of Elko) were lower than those in Eureka County and the State of Nevada, but slightly above those in Lander County. The community of Spring Creek had the highest household, family, and nonfamily household median income in the study area; median incomes in Spring Creek were also substantially higher than the State of Nevada in each category.

Table 4.16.5 summarizes poverty status by race in Elko County for 1989. Elko County and its communities had the lowest incidence of poverty by percent in the study area for White and Black persons. It had a higher incidence of poverty for American Indian, Eskimo, or Aleut and Other Race than the State of Nevada.

According to BEARFACTS for 1986 - 1996, Eureka County had a PCPI of $23,361 in 1996, ranking 5th of 17 counties in Nevada. In 1986, the PCPI was $15,042 and ranked 5th in the state. The average annual growth rate of PCPI over the past 10 years was four and five-tenths percent, slightly lower than the five and two-tenths percent average for the state and the four and nine-tenths percent average for the nation.

According to income data presented in Table 4.16.4, the Eureka County per capita income of $14,474 is generally consistent with BEA's PCPI income for 1986. Eureka County and the communities of Beowawe and Crescent Valley had among the highest per capita incomes in the study area, surpassed only by Elko (City). The per capita income in Eureka County and its communities still lagged slightly behind the State of Nevada. With the exception of Spring Creek, Beowawe and Crescent Valley also had the highest family median income in the study area. Only nonfamily household income in Eureka County was lower than the State of Nevada.

Table 4.16.5 summarizes poverty status by race in Eureka County for 1989. Eureka County had the highest incidence of poverty by percent in the study area for White persons, but a relatively low incidence

Table 4.16.2: 1990 Age Distribution of Study Area and State of Nevada Populations

Location[a]	Age 0-4		Age 5-13		Age 14-17		Age 18-24		Age 25-64		Age 65+		Total Population
	Qty.	% of Total	Qty.	% of Total	Qty.	% of Total	Qty.	% of Total	Qty.	% of Total	Qty.	% of Total	
Elko County	3,267	10%	5,498	16%	1,931	6%	3,318	10%	17,517	52%	1,999	6%	33,530
Carlin	156	7%	341	15%	119	5%	216	10%	1,260	57%	128	6%	2,220
Elko/Spring Creek (CDP)[b]	2,096	10%	3,287	16%	1,144	6%	2,026	10%	10,840	52%	1,326	6%	20,719
Eureka County	136	9%	215	14%	77	5%	116	7%	875	57%	128	8%	1,547
Beowawe[c]	5	9%	6	10%	2	3%	5	9%	34	59%	6	10%	58
Crescent Valley[c]	23	9%	32	12%	11	4%	24	9%	153	57%	27	10%	270
Lander County	596	10%	1,138	18%	381	6%	595	9%	3,192	51%	364	6%	6,266
Battle Mountain (CDP)[b]	368	10%	636	18%	180	5%	395	11%	1,773	50%	190	5%	3,542
State of Nevada	91,383	8%	146,633	12%	56,743	5%	117,436	10%	662,437	55%	127,201	11%	1,201,833

[a] U.S. Department of Commerce, Bureau of the Census, 1990 U.S. Census, Summary Tape File 3A and 3C1 unless otherwise noted.
[b] CDP = Census Designated Place.
[c] Bureau of Business and Economic Research, University of Nevada, Reno, Geodemographic Analysis - Crescent Valley, Beowawe and Battle Mountain, July 1997 Block Group Level Estimates Produced by Claritas (analysis performed at the request of EMA).

Table 4.16.3: 1990 Ethnic Composition of Study Area and State of Nevada Populations

Location[a]	White			Black			American Indian, Eskimo, or Aleut			Asian or Pacific Islander			Other Race			Total Population
	Qty.	% of Total	% His-panic	Qty.	% of Total	% His-panic	Qty.	% of Total	% His-panic	Qty.	% of Total	% His-panic	Qty.	% of Total	% His-panic	
Elko County	29,004	87%	8%	280	1%	2%	2,014	6%	8%	309	1%	1%	1,923	6%	98%	33,530
Carlin	2,066	93%	3%	70	3%	0%	28	1%	21%	4	0.2%	100%	52	2%	94%	2,220
Elko/Spring Creek (CDP)[b]	18,794	91%	7%	58	0.3%	0%	404	2%	12%	235	1%	0%	1,228	6%	98%	20,719
Eureka County	1,467	95%	6%	4	0.3%	0%	32	2%	6%	6	0.4%	0%	38	2%	100%	1,547
Beowawe[c]	57	98%	n/a	0	0%	n/a	1	2%	n/a	0	0%	n/a	0	0%	n/a	58
Crescent Valley[c]	254	95%	n/a	3	1%	n/a	4	1%	n/a	3	1%	n/a	3	1%	n/a	267
Lander County	5,669	90%	8%	11	0.2%	0%	319	5%	24%	27	0.4%	33%	240	4%	100%	6,266
Battle Mountain (CDP)[b]	3,223	91%	11%	11	0.3%	0%	148	4%	22%	11	0.3%	0%	149	4%	100%	3,542
State of Nevada	1,012,890	84%	7%	78,310	7%	2%	20,398	2%	11%	38,053	3%	3%	52,182	4%	98%	1,201,833

a U.S. Department of Commerce, Bureau of the Census, 1990 U.S. Census, Summary Tape File 3A and 3C1 unless otherwise noted.
b CDP = Census Designated Place.
c Bureau of Business and Economic Research, University of Nevada, Reno, Geodemographic Analysis - Crescent Valley, Beowawe and Battle Mountain, July 1997 Block Group Level Estimates Produced by Claritas (analysis performed at the request of EMA).

Table 4.16.4: 1989 Income Level of the Study Area Compared with the State of Nevada

Location[a]	Per Capita Income	Median Income[b]		
		Households	Families	Nonfamily Households
Elko County	$14,050	$33,715	$38,900	$19,767
Carlin	$13,961	$34,348	$37,700	$24,643
Elko	$15,734	$35,249	$41,008	$21,869
Spring Creek (CDP)[c]	$14,193	$44,139	$46,314	$31,397
Eureka County	$14,474	$31,047	$36,190	$20,139
Beowawe[d]	$14,969	$35,250	$42,344	n/a
Crescent Valley[d]	$14,886	$35,403	$42,282	n/a
Lander County	$13,167	$33,988	$37,515	$21,328
Battle Mountain (CDP)[c]	$13,875	$34,816	$38,426	$25,066
State of Nevada	$15,214	$31,011	$35,837	$20,413

[a] U.S. Department of Commerce, Bureau of the Census, 1990 U.S. Census, Summary Tape File 3A and 3C1 unless otherwise noted.
[b] A household includes all the persons who occupy a housing unit. A family household consists of a householder living with one or more persons related to him or her by birth, marriage, or adoption. A nonfamily household consists of a householder living alone or with nonrelatives only.
[c] CDP = Census Designated Place.
[d] Bureau of Business and Economic Research, University of Nevada, Reno, Geodemographic Analysis - Crescent Valley, Beowawe and Battle Mountain, July 1997 Block Group Level Estimates Produced by Claritas (analysis performed at the request of EMA).

of poverty for American Indian, Eskimo, or Aleut. Although Eureka County was on par with the State of Nevada for percentage of total population living below the poverty level, the communities of Beowawe and Crescent Valley were substantially lower than the State and were the lowest in the study area.

According to BEARFACTS for 1986 - 1996, Lander County had a PCPI of $21,413 in 1996, ranking 9th of 17 counties in Nevada. In 1986, the PCPI was $12,509 and ranked 11th in the state. The average annual growth rate of PCPI over the past 10 years was five and one-half percent, the highest in the study area and slightly higher than the state average.

Table 4.16.4 notes that in 1989, the per capita income in Lander County was $13,167, which is generally consistent with the PCPI income for 1986. Table 4.16.4 also shows that the per capita incomes in Lander County and the community of Battle Mountain are significantly lower than the State of Nevada, and are the lowest in the study area. However, Lander County had the highest household income of the three study area counties. Family median income in Lander County and Battle Mountain tended to fall between Elko and Eureka Counties median income and their respective communities, but surpassed the State of Nevada. With the exception of Spring Creek, Battle Mountain had the highest nonfamily household income in the study area.

Table 4.16.5 summarizes poverty status by race in Lander County for 1989. Lander County had the highest incidence of poverty by percent in the study area for Black persons, and with the exception of

Table 4.16.5: Persons Below Poverty Level by Race in the Study Area Compared with the State of Nevada (1989).

Location[a]	White		Black		American Indian, Eskimo, or Aleut		Asian or Pacific Islander		Other Race		Total Population	
	Number Below Poverty Level[b]	% Total Race	Number Below Poverty Level	% Total Race	Number Below Poverty Level	% Total Race	Number Below Poverty Level	% Total Race	Number Below Poverty Level	% Total Race	Number Below Poverty Level	% Total Pop.
Elko County	1,963	7%	14	5%	614	30%	26	8%	472	25%	3,089	9%
Carlin	116	6%	0	0%	12	43%	0	0%	0	0%	128	6%
Elko/Spring Creek (CDP)[c]	905	5%	14	24%	57	14%	16	7%	307	25%	1,299	6%
Eureka County	142	10%	2	50%	5	16%	0	0%	8	21%	157	10%
Beowawe[d]	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	2	3%
Crescent Valley[d]	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	14	5%
Lander County	494	9%	6	55%	123	39%	0	0%	45	19%	668	11%
Battle Mountain (CDP)[c]	280	9%	6	55%	48	32%	0	0%	45	30%	379	11%
State of Nevada	83,235	8%	17,262	22%	4,766	23%	3,843	10%	10,554	20%	119,660	10%

a U.S. Department of Commerce, Bureau of the Census, 1990 U.S. Census, Summary Tape File 3A and 3C1 unless otherwise noted.
b The average poverty threshold for a family of four persons was $12,674 in 1989. The poverty threshold is not adjusted for regional, state, or local variations in the cost of living.
c CDP = Census Designated Place.
d Bureau of Business and Economic Research, University of Nevada, Reno, Geodemographic Analysis - Crescent Valley, Beowawe and Battle Mountain, July 1997 Block Group Level Estimates Produced by Claritas (analysis performed at the request of EMA).

Carlin, for American Indian, Eskimo or Aleut. Battle Mountain had the highest incidence of poverty for Other Race in the study area. Lander County had the highest percentage of the total population living below the poverty level in the study area, and a higher percentage than the State of Nevada.

4.16.2.2.2 Economy and Employment

The economy of north-central Nevada has historically been dominated by the mining, ranching and agriculture, and service industries. Mining in numerous districts throughout the area produced gold, silver, barite, and base metals. Significant production began in the mid-1800s, and marked the first of several cycles of mining industry expansion. Ranching and agriculture grew in importance as economic mainstays for the counties during the first half of the 1900s, but declined in importance as the boom in mineral exploration and mining of precious metals began along the Carlin and Battle Mountain trends. In 1995, as in previous years, Nevada led the U.S. in gold production, producing just under 6.8 million ounces, approximately two-thirds of total U.S. production. The total value of this output was $2.6 billion and was estimated to produce, along with silver production, approximately 51,500 jobs in the state (Dobra 1997). Associated with the latest growth of the mining industry has been an increase in construction, service, casino gaming, and government jobs.

Employment by industry for each of the study area counties and communities is summarized in Table 4.16.6. The prevalence of the mining industry in the study area is readily apparent. Lander County had the highest percentage of its work force employed in mining in 1990, 48 percent, compared to the other study area counties. Of the study area communities, Carlin, Beowawe/Crescent Valley, and Battle Mountain had the highest percentage of participation in the mining industry; 51, 47, and 48 percent, respectively. The entire study area had a greater proportion of workers employed in mining than the state as a whole (two percent). Overall, the counties and communities within the study area had significantly fewer workers employed in manufacturing; wholesale and retail trade; finance, insurance, and real estate; and services than the State of Nevada. Eureka County and the communities of Beowawe and Crescent Valley appeared to have the least diversified economies in 1990, concentrated primarily in the agriculture, forestry, and fisheries, and mining industries. Construction appeared to have a comparable importance to the study area economies as to the entire state. Nearly ten percent of the work force in each study area county traveled outside of the county to work in 1990 (U.S. Department of Commerce 1991).

Although mining is a major industry in all of the study area counties, Elko County shows the most diversification of its economy compared to the rest of the study area. According to BEARFACTS, mining represented 13.4 percent of the total earnings of persons employed in Elko County in 1996, ranking third behind services and state and local government. The share of mining industry earnings increased 11.6 percent in 1986. Wholesale trade was the fastest growing segment of the economy between 1986 and 1996. This data indicates Elko's importance to the area as a regional trade and service center, particularly as the hub of mining-related goods and services. Data from BEARFACTS further indicates the lack of diversification in Eureka and, to a lesser extent, Lander County. Mining represented 90.8 percent of total earnings in Eureka County, ranking first in the County followed by construction and state and local government. Mining's share of earnings increased from 79 percent in 1986, and represented the fastest growing industry in the County during the 1986 to 1996 period. Lander County fell between Elko and Eureka Counties, with mining representing 57.2 percent of total earnings. Mining ranked first in the County followed by state and local government and services. This is only a slight increase from 1986 when mining represented 55.8 percent of earnings. The service industry was the fastest growing segment of the County's economy between 1986 and 1996.

The composition of each counties' economy is further exhibited in Table 4.16.7, which lists the top employers in each county. As shown in the table, CGM is the second-largest employer in Lander County. Each study area county lists diversification of their economy and attraction of new industry and businesses as goals for economic development (County of Elko 1997; County of Eureka 1995; and Tri-County Development Authority 1997).

Estimates of average weekly wages are provided by the Nevada Department of Employment, Training and Rehabilitation (NDETR). For the final quarter of 1997, the highest average weekly wage in both Elko and Eureka Counties was earned in the mining industry ($1,083 and $1,131, respectively). The mining wage in both counties was nearly $400 above average weekly wage earned in the second highest industry, construction. The average weekly wage earned in

Table 4.16.6: 1990 Employment by Industry in Study Area Compared with the State of Nevada

Industry[a]	Elko County						Eureka County				Lander County				State of Nevada	
	County		Carlin		Elko/Spring Creek (CDP)[b]		County		Beowawe/ Crescent Valley[c]		County		Battle Mountain (CDP)[b]			
	Qty.	% of Total	Qty.	% of Total	Qty.	% of Total	Qty.	% of Total	Qty.	% of Total	Qty.	% of Total	Qty.	% of Total	Qty.	% of Total
Agriculture, Forestry, and Fisheries	762	5%	11	1%	170	2%	199	25%	47	26%	168	6%	12	1%	10,303	2%
Mining	4,473	30%	518	51%	3,324	32%	269	33%	86	47%	1,231	42%	799	48%	13,890	2%
Construction	1,111	8%	89	9%	683	6%	55	7%	8	4%	216	7%	107	6%	53,003	9%
Manufacturing	312	2%	17	2%	217	2%	12	1%	0	0%	89	3%	38	2%	36,095	6%
Transportation, Communication, and Other Public Utilities	917	6%	69	7%	609	6%	23	3%	1	1%	142	5%	63	4%	40,838	7%
Wholesale and Retail Trade	789	5%	117	12%	1,779	17%	67	8%	12	7%	388	13%	201	12%	116,313	19%
Finance, Insurance, and Real Estate	406	3%	6	1%	299	3%	13	2%	0	0%	35	1%	28	2%	36,689	6%
Services	5,295	36%	147	15%	3,024	29%	123	15%	22	12%	483	17%	293	18%	271,662	45%
Public Administration	695	5%	35	3%	418	4%	47	6%	7	4%	166	6%	129	8%	28,644	5%
Total - Employed Persons 16 years and over	14,760	100%	1,009	100%	10,523	100%	808	100%	183	100%	2,918	100%	1,670	100%	607,437	100%

a U.S. Department of Commerce, Bureau of the Census, 1990 U.S. Census, Summary Tape File 3A and 3C1 unless otherwise noted.
b CDP = Census Designated Place.
c Data for Census Tract 9602 which includes the communities of Beowawe, Crescent Valley, and Palisade.

Table 4.16.7: Top Employers in Each Study Area County

Employer (Number of Employees)		
Elko County	**Eureka County**	**Lander County**
• Elko County School District (1,400-1,499) • Cactus Petes, Inc. (800-899) • Elko R L Casino, Inc. (600-699) • Peppermill Hotel Casino - Wendover (600-699) • Independence Mining Company, Inc. (600-699) • Silver Smith Casino Resort (500-599) • Stateline Hotel, Inc. (500-599) • Stockmens Casino and Hotel (400-499) • State of Nevada (400-499) • Rainbow Casino and Hotel (400-499)	• Newmont Gold Company (2,200-2,299) • Barrick Goldstrike Mines, Inc. (1,700-1,799) • Eureka County Auditor (100-199) • Newmont Exploration Ltd. (100-199) • Eureka County School District (100-199) • Mine Service and Supply Co. Inc. (0-99) • Stewart Brothers Drilling Company (0-99) • Small Mine Development (0-99) • Nevada Department of Transportation (0-99) • Owl Club and Steak House (0-99)	• Echo Bay Minerals Company (400-499) • Cortez Gold Mines (400-499) • Lander County School District (100-199) • Battle Mountain Gold Company (100-199) • Lander County (100-199) • Santa Fe Pacific Gold Corp. (0-99) • Colt Service Center (0-99) • M-I Drilling Fluids LLC (0-99) • Battle Mountain General Hospital (0-99) • Bureau of Land Management (0-99)

Source: NDETR 1998. Data is from the first quarter of 1997 and may not reflect current conditions.

mining was lower in Lander County, $950, and trailed the manufacturing wage by nearly $80 (NDETR 1998).

The existing average monthly payroll for CGM's current operations is approximately $1.9 million. Assuming that approximately 70 percent of this is disposable income (based on an average tax rate of 30 percent), then approximately $1.3 million is spent monthly in the study area on consumer goods, services, entertainment, and savings, with some leakage out of the study area. According to University of Nevada economist John Dobra, disposable income spent would multiply through the state's economy, generating more spending at a rate of 2.57 (Dobra 1989). This means that the initial $1.3 million spent could generate an additional $2.1 million in statewide spending each month.

Labor force and employment statistics for 1990 through 1997 for the study area counties and the State of Nevada are presented in Table 4.16.8. Total employment has been generally increasing for Elko County and the state; however, Eureka and Lander Counties have experienced drops in total employment since 1990, with marked decreases during 1993 through 1996 reflecting the slowdown in the mining industry. Unemployment in Eureka and Lander Counties remained percentage points above the state average in 1997; however, like Elko County unemployment in Eureka and Lander Counties has been decreasing since 1993-1994 highs. Unemployment, as measured during the first quarter of 1998, increased in each study area county (Elko County - 6.2 percent, Eureka County - seven and one-half percent, and Lander County - 11.2 percent) (NDETR 1998). The recent rise in unemployment corresponds with the layoffs in mining that resulted from sharp drops in the price of gold during late-1997.

4.16.2.2.3 Housing

Housing characteristics as found during the 1990 U.S. Census are summarized for study area counties and communities in Table 4.16.9. Current average prices for homes and rentals within the study area are substantially higher than 1990 median values shown in

Table 4.16.8: Labor Force Statistics for the Study Area Compared with the State of Nevada

	Yearly Averages[a]							
Location	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**
ELKO COUNTY								
Total Labor Force:	17,660	18,080	19,070	19,540	19,990	19,940	20,790	21,590
Employment:	16,770	17,260	17,890	18,160	18,760	18,780	19,690	20,670
Total Unemployment:	890	820	1,090	1,380	1,230	1,160	1,100	920
Unemployment Rate:	5.0 %	4.5 %	5.7 %	7.1 %	6.1 %	5.8 %	5.3 %	4.3 %
EUREKA COUNTY								
Total Labor Force:	850	870	840	860	750	740	810	840
Employment:	800	830	790	800	670	670	750	790
Total Unemployment:	50	40	50	60	80	70	60	50
Unemployment Rate:	5.7 %	4.2 %	5.6 %	7.3 %	10.9 %	8.8 %	7.4 %	6.2 %
LANDER COUNTY								
Total Labor Force:	3,080	3,020	3,140	2,980	2,940	2,910	3,070	3,040
Employment:	2,870	2,850	2,890	2,640	2,610	2,640	2,810	2,830
Total Unemployment:	210	170	250	340	330	270	260	210
Unemployment Rate:	6.7 %	5.5 %	7.8 %	11.3 %	11.3 %	9.1 %	8.6 %	6.9 %
STATE OF NEVADA								
Total Labor Force:	667,000	693,000	715,000	739,000	779,500	804,300	840,600	883,200
Employment:	633,100	654,800	667,400	686,000	731,500	760,300	795,100	847
Total Unemployment:	33,000	38,000	47,000	53,000	48,000	43,400	45,500	36,200
Unemployment Rate:	4.9 %	5.5 %	6.6 %	7.2 %	6.2 %	5.4 %	5.4 %	4.1 %

[a] Nevada Department of Employment, Training and Rehabilitation, Information Development and Processing, Research and Analysis Bureau, Yearly Averages, April 3, 1998 Facsimile.

the table. Average single family homes cost approximately $100,000 in 1998, with the highest costs in Elko and Spring Creek. The current cost of a mobile home averages $55,000, with the highest costs in Carlin, Elko, and Spring Creek. Average current rental prices are $500 for a one-bedroom, $600 for a two-bedroom, and $700 for a three-bedroom unit. The highest rental costs occur in Carlin and Spring Creek. A summary of the housing characteristics presented in Table 4.16.9 and temporary housing facilities are discussed below by county.

Elko County

Vacancy rates in Elko County ranged from a low of five percent in Spring Creek to a high of 13 percent for the entire county. The quantity of single family units in communities throughout the county were on par with the State of Nevada (approximately 45 percent of total housing units). Communities in Elko County had a much lower quantity of multiple family housing units than the State of Nevada (a high of 25 percent of housing units in Elko compared with 40 percent in the State of Nevada), and more mobile homes (a high of 59 percent in Spring Creek compared with 14 percent in the State of Nevada). Housing units in Elko County tended to be owner-occupied, ranging from 55 percent in Elko to 81 percent in Spring Creek.

Hotels and motels may be rented by the night or week in the City of Carlin. There are approximately two hotel/motel establishments (79 rooms) offering

Table 4.16.9: Housing Characteristics of the Study Area and State of Nevada

	Housing Units									Tenure		Housing Costs		
	Single Family (Detached)		Multiply Family (Attached)		Mobile Homes		Other							
Location[a]	Qty.	% of Total	Qty.	% of Total	Qty.	% of Total	Qty.	% of Total	Total Units	Owner-Occupied (%)	Tenant-Occupied (%)	Median Value ($)	Median Rent ($)	Vacancy Rate (%)
Elko County	6,017	45%	2,349	17%	4,907	36%	188	1%	13,461	56%	31%	$81,300	$435	13%
Carlin	374	42%	73	8%	436	49%	5	1%	888	64%	26%	$59,100	$471	10%
Elko	2,827	48%	1,444	25%	1,538	26%	71	1%	5,880	55%	37%	$85,700	$481	7%
Spring Creek (CDP)[b]	743	39%	45	2%	1,126	59%	0	0%	1,914	81%	13%	$88,300	$607	5%
Eureka County	251	31%	38	5%	510	62%	18	2%	817	52%	24%	$53,800	$424	24%
Beowawe/Crescent Valley[c]	54	22%	6	2%	183	73%	7	3%	250	51%	11%	$36,300	$363	38%
Lander County	845	33%	122	5%	1,587	61%	32	1%	2,586	60%	25%	$61,100	$374	14%
Battle Mountain (CDP)[b]	437	31%	109	8%	875	61%	10	1%	1,431	57%	31%	$61,700	$367	12%
State of Nevada	234,607	45%	208,123	40%	70,551	14%	5,577	1%	518,858	49%	41%	$95,300	$509	10%

[a] U.S. Department of Commerce, Bureau of the Census, 1990 U.S. Census, Summary Tape File 3A and 3C1 unless otherwise noted.
[b] CDP = Census Designated Place.
[c] Data for Census Tract 9602 which includes the communities of Beowawe, Crescent Valley, and Palisade.

temporary housing in Carlin. In addition, there are two RV parks consisting of a total of 96 vehicle spaces. There are no campground facilities located within Carlin (Personal communication, Sharon Ankrum, City of Carlin, Planning Board Secretary, April 22, 1998). Temporary housing may be rented by the night or week in the City of Elko. There are approximately 34 hotel/motel establishments (1,690 rooms) offering temporary housing in Elko. In addition, there are six RV parks in the vicinity of Elko with a total of 437 vehicle spaces and nine campground facilities with approximately 232 camping spaces (Personal communication, Jessica Finlayson, Elko Chamber of Commerce, Administrative Assistant, April 22, 1998). There are no hotels, motels, or RV parks located in Spring Creek; however, there is one campground facility consisting of 29 spaces available to both Spring Creek residents and non-residents (Personal communication, Duane McPherson, Spring Creek Association, President, April 22, 1998).

Eureka County

As shown in Table 4.16.9, vacancy rates in Eureka County were the highest in the Study Area, with 24 and 38 percent of the housing units vacant in the County and Beowawe/Crescent Valley, respectively. Eureka County also maintains a unique distinction by having the highest percentage of mobile homes of any county in Nevada and the nation. According to a recent housing inventory associated with the Eureka County Master Plan Update, there were approximately 958 homes located in the County in 1997, of which 633 units (66 percent) were considered mobile homes (Personal communication, Mike Baughmann, Intertech Services Corporation, April 27, 1998). The high percentage of mobile homes is attributable to the lack of available housing, lack of available financing, and the demands of the mining industry. Eureka County and the Beowawe/Crescent Valley census tract had the lowest percentage of multiple family units in the Study Area, only five and two percent, respectively, compared to 40 percent for the State of Nevada. Approximately one-half of the housing units in the County and Beowawe/Crescent Valley were owner-occupied.

There are no traditional hotels or motels in Crescent Valley and Beowawe; however, there are several residents that offer nightly rates to rent mobile homes in the community of Crescent Valley. There are also three RV parks located in the Crescent Valley consisting of a total of 60 spaces. The RV parks are currently half full and have capacity for additional people (Personal communication, Vicki Drenon, Crescent Valley Town Hall, Town Secretary, April 23, 1998).

Lander County

Like Eureka County, Lander County and Battle Mountain had fewer single and multiple family housing units compared with the State of Nevada, and far more mobile homes. Approximately 61 percent of the housing stock in both Lander County and Battle Mountain consisted of mobile home units. Vacancy rates in the area, a high of 14 percent for the County, were not as high as Eureka County and tended to more closely track with the state (10 percent) and Elko County. Like Elko County, more of the housing units in Lander County were owner-occupied (approximately 60 percent) compared to the State of Nevada (49 percent).

Hotels and motels may be rented by the night or week in Battle Mountain. There are approximately eight hotel/motel establishments (279 rooms) offering temporary housing in Battle Mountain (Personal communication, Pat Campbell, Battle Mountain Realty, Realtor, April 28, 1998). In addition, there are two RV parks with approximately 400 vehicle spaces, six mobile home parks, and one campground facility in the area (Personal communication, Dave Davis, Battle Mountain Field Office of the Bureau of Land Management, Fire Management Specialist, April 28, 1998).

4.16.2.2.4 Public Utilities and Services

Water

Elko County

The majority of the residents living in unincorporated Elko County rely on individual wells and surface springs for domestic use. Residents in incorporated areas rely on public or private water systems as described below.

The City of Carlin is responsible for supplying water to approximately 975 customers within the city limits. Water is supplied by one municipal well and two surface springs. The City also maintains two storage tanks, as well as a series of distribution mains. The City of Carlin has the capacity to serve an additional 2,500 people without modifications to the existing system (Personal communication, Laurel Greenwood, City of Carlin, Public Works Secretary, March 23, 1998).

The City of Elko Engineering Department is responsible for supplying water to approximately 20,000 customers within city limits, as well as a to a few customers located directly adjacent to the city limits. The City of Elko's water system consists of 18 municipal wells with a combined production capacity of 17 million gallons per day (mgd), seven water storage tanks, and a series of distribution mains. The Elko Engineering Department has the capacity to serve additional customers without modifications to the existing system for the next five years; however, the Engineering Department is planning on drilling another well in 1999 (Personal communication, Lisa Hermansen, City of Elko Engineering Department, Engineering Technician, May 17, 1999).

Spring Creek Utilities is responsible for supplying water to approximately 3,140 customers in the unincorporated community of Spring Creek. Spring Creek Utilities maintains ten water wells with a combined production capacity of 2.5 mgd, eight water storage tanks, and a series of distribution mains. Spring Creek Utilities has the capacity to serve additional customers without modifications to the existing system (Personal communication, Ryan Limberg, Spring Creek Utilities, Manager, May 18, 1999).

Eureka County

Residents living in unincorporated Eureka County, including Beowawe, rely on individual wells and surface springs for domestic use. The Crescent Valley Town Board is responsible for supplying water to approximately 247 customers and maintains three water wells, two water storage tanks with a combined capacity of approximately 350,000 gallons, and a series of distribution mains. The Crescent Valley Town Board has the capacity to serve additional customers without modifications to the existing system; however, the board plans to construct an additional 200,000-gallon water storage tank in mid-1999 (Personal communication, Vicki Drenon, Crescent Valley Town Hall, Town Secretary, May 17, 1999).

Lander County

The majority of the residents living in unincorporated Lander County rely on individual wells and surface springs for domestic use. Residents in the town of Battle Mountain are provided water by Battle Mountain Water and Sewer. Battle Mountain Water and Sewer is responsible for supplying water to approximately 1,200 customers and maintains four water wells (currently used at 50 percent capacity), two water storage tanks, and a series of distribution mains. Battle Mountain Water and Sewer has the capacity to serve additional customers without modifications to the existing system (Personal communication, Bonnie Duke, Lander County, Manager, March 24, 1998).

Wastewater Treatment

Elko County

Residents of unincorporated Elko County rely on private septic systems to dispose of domestic sewage. Residents in incorporated areas rely on a public collection and treatment facilities as described below.

The City of Carlin's wastewater treatment plant has a capacity to treat approximately 500,000 gpd. The plant does not have the capacity to serve additional customers without modifications to the existing facility. Future residents and businesses will need to construct septic systems until expansion of the existing wastewater treatment facility can be funded and constructed (Personal communication, Laurel Greenwood, City of Carlin, Public Works Secretary, March 23, 1998).

The City of Elko Engineering Department's wastewater treatment plant has the capacity to treat approximately 4.5 mgd. The Elko wastewater treatment plant has the capacity to treat an additional 1.7 mgd without modifications to the existing facility (Personal communication, Will Whitmore, City of Elko Engineering Department, Superintendent of the Elko Reclamation Facility, March 23, 1998).

Spring Creek Utilities maintains a limited series of public sewers and provides wastewater treatment services to approximately 50 customers. Remaining residents rely on private septic systems. The Spring Creek wastewater treatment plant currently treats approximately 22,000 gpd and has the capacity to treat an additional 5,000 gpd without modifications to the existing facility (Personal communication, Ryan Limberg, Spring Creek Utilities, Manager, March 24, 1998).

Eureka County

Residents of unincorporated Eureka County, including Beowawe and Crescent Valley rely on private septic systems to dispose of domestic sewage. The Crescent Valley Town Board is currently pursuing money through a Community Development Block Grant

(CDBG) program to fund the preparation of a wastewater feasibility study to identify the need for a community wastewater treatment system (Personal communication, Vicki Drenon, Crescent Valley Town Hall, Town Secretary, March 23, 1998).

Lander County

Residents of unincorporated Lander County rely on private septic systems to dispose of domestic sewage. Residents of the town of Battle Mountain are provided public sewer and wastewater treatment services by Battle Mountain Water and Sewer. The Battle Mountain Water and Sewer wastewater treatment plant currently treats approximately 0.64 mgd and has the capacity to treat an additional 1.2 mgd. (Personal Communication, Karen Morgan, Battle Mountain Water and Sewer, Secretary, March 24, 1998). Battle Mountain Water and Sewer has the capacity to serve additional people without modifications to the existing facility; however, the plant is expected to be upgraded to accommodate future growth (Personal Communication, Bonnie Duke, Lander County, Manager, March 24, 1998).

Solid Waste Disposal

Elko County

The majority of solid waste generated in the unincorporated areas of Elko County as well as the City of Elko, City of Carlin, and Spring Creek is collected by the Elko Sanitation Company and transported to the Elko Landfill which is owned and operated by the City of Elko. The landfill is considered a Class I industrial/municipal landfill. The Elko Landfill currently processes approximately 140 tons per day (tpd) of solid waste and is expected to process approximately 1,000 tpd by late-1998. The Elko Landfill has the capacity to serve additional development for the next 100 years without modifications to the existing facility (Personal communication, Evan Dodson, City of Elko Public Works Department, Solid Waste Superintendent, March 24, 1998). Residents of rural areas of Elko County may haul their household wastes to a compactor container bin which is collected on a regular basis by Elko Sanitation Company.

Eureka County

Solid waste generated in the town of Crescent Valley is collected by Battle Mountain Disposal and transported to the Battle Mountain Landfill which is owned by Lander County and operated by Canyon Construction. The Battle Mountain Landfill is considered a Class III municipal landfill. When solid waste is collected in one county and disposed of in another county, it is subject to additional gate fees. The Battle Mountain Landfill currently processes approximately 20 tpd of solid waste and has the capacity to process an additional 50 tpd. The Battle Mountain Landfill has the capacity to serve additional growth for the next 20 years without modifications to the existing facility (Personal Communication, Bonnie Duke, Lander County, Manager, March 24, 1998 and Choch Zaca, Manager, Canyon Waste Disposal, March 27, 1998). Residents of rural areas of Elko County may haul their household wastes to collection bin which are collected on a regular basis by Battle Mountain Disposal.

Lander County

Most of the solid waste generated in the unincorporated areas of Lander County, as well as the by the town of Battle Mountain, is collected by Battle Mountain Disposal and transported to the Battle Mountain Landfill. Residents of rural areas of Lander County may haul their household wastes to collection bins which are collected on a regular basis by Battle Mountain Disposal.

Emergency Services

Law enforcement, fire protection, and ambulance services available in the study area are summarized by county and community in Table 4.16.10.

Health Care and Social Services

Elko County

Major medical services in Elko County are provided by the Elko General Hospital, which serves all of northeastern Nevada including the portions of the study area located in Elko, Eureka, and Lander Counties. Elko General is located in the City of Elko and has an active medical staff of approximately 35 doctors and has 50 acute patient beds. Patients with life threatening injuries are flown via Care Flight to either Reno or Salt Lake City, Utah for medical care.

Additional medical services are provided by the Elko County Public Health Department which offers limited preventative health services. Health services are also offered by the Elko Clinic and Pioneer Urgent Care. The Elko Clinic has a staff of approximately 77 doctors, nurses, and administrative personnel and is a

Table 4.16.10: Emergency Services Serving Study Area Counties and Communities

Service Type	Agency	Description of Staff	Description of Facilities	Jurisdiction/Additional Areas Covered	Adequacy
			Elko County		
Law Enforcement	Elko County Sheriff's Dept.	47 law enforcement officers 11 civilian staff members	Headquarters in City of Elko; 5 substations; 140-bed jail facility and regional juvenile probation center in City of Elko.	Unincorporated Elko County; participate in a mutual assist program with the Nevada Highway Patrol (NHP), adjacent county sheriff's departments, and city police departments.	Jail facility is currently over capacity on weekends and officer to inmate ratio is below the national average.
Fire Protection	State of Nevada Division of Forestry (NDF); Northeastern Fire Protection District (NFPD)	NDF - 34 paid firefighters NFPD - volunteers	Spring Creek: 3 stations; 2 engines; 2 pumpers; 2 tenders; 2 wildland trucks; 1 command vehicle	Unincorporated Elko County, including Spring Creek; BLM responsible for fighting wildland fires on Federal land; has a mutual aid agreement with Elko Fire Dept. for Spring Creek area.	Unknown.
Ambulance	Elko Ambulance	1 full-time paid director 3 assistant directors 30 volunteers	5 ambulances (includes 2 in the City of Elko)	Elko County; emergencies are transported to Elko General Hospital.	Existing facilities, equipment, and staff are adequate.
			Elko (City)		
Law Enforcement	Elko Police Dept.	35 law enforcement officers 36 civilian staff members	1 station; utilize county jail facility and regional juvenile probation center.	Incorporated City of Elko; participate in a mutual assist program with NHP and Elko County Sheriff's Dept.	Existing facilities, equipment, and staff are not adequate to maintain a sufficient level of service.
Fire Protection	Elko Fire Dept.	15 firefighters 3 administrative staff 30 volunteers	3 stations; 7 engines, 2 crash trucks, and access to 3 NDF vehicles.	Incorporated City of Elko; will respond to calls approximately 8 miles from city limits; participate in aid agreement with NDF for areas outside the city limits.	Existing staff and equipment are adequate.
			Carlin		
Law Enforcement	Carlin Police Dept.	1 chief 6 law enforcement officers 1 civilian staff member	One station; utilize county jail facility and regional juvenile probation center.	Incorporated City of Carlin. Participate in mutual assist program with NHP, Elko County Sheriff's Dept., and Elko Police Dept.	Existing facilities, equipment, and staff are not adequate to maintain a sufficient level of service.

(Continued on next page)

Service Type	Agency	Description of Staff	Description of Facilities	Jurisdiction/Additional Areas Covered	Adequacy
Fire Protection	Carlin Volunteer Fire Dept.	26 volunteers	1 station; 3 fire trucks; 2 ambulances; 1 service truck	Incorporated City of Carlin; will respond to calls 50 miles north, 70 miles south, 12 miles east, and 25 miles west of Carlin; participates in mutual aid agreements with NDF, and Elko and Eureka counties; dept. has staff capable of responding to medical emergencies.	Existing staff and equipment are adequate.
			Eureka County		
Law Enforcement	Eureka County Sheriff's Dept.	1 sheriff, 1 under sheriff 9 law enforcement officers 6 dispatchers 5 jailers 2 civilians (3 law enforcement officers are assigned to Crescent Valley substation)	Headquarters in Eureka; 1 substation in Crescent Valley; 20-bed detention facility in Eureka; utilize Elko County jail facility for longer-term inmates.	Unincorporated areas in Eureka County; participate in mutual assist program with NHP and adjacent county sheriff's departments.	Existing facilities and staff are adequate; however, the department lacks adequate staff to transport criminals to jail facilities in Eureka or Elko.
Fire Protection	Eureka Volunteer Fire Dept.	1 full-time chief 74 volunteer firefighters	6 stations (including stations in Beowawe and Crescent Valley)	Populated areas of Eureka County; NDF and BLM fight wildland fires in rural areas.	Existing facilities and staff are adequate.
Ambulance	Eureka County	8 technicians	2 ambulances (1 in Eureka and 1 in Crescent Valley)	Eureka County; emergencies are transported to Elko General Hospital.	Existing facilities, equipment, and staff are adequate.
			Beowawe/Crescent Valley		
Fire Protection	Beowawe Volunteer Fire Department; Crescent Valley Volunteer Fire Department	Beowawe: 10 volunteer firefighters Crescent Valley: 10 volunteer firefighters	Beowawe: 2 pumpers; quick response truck; 3,000-gallon tanker truck. Crescent Valley: 2 pumpers; 3,000-gallon tanker truck.	Beowawe: serves the town of Beowawe; responds to calls outside of town boundaries. Crescent Valley: serves the town of Crescent Valley; responds to calls as far as Boulder Valley to north and Grass Valley to south.	Beowawe: existing staff is adequate; however, the dept. is planning an expansion of current facility to better serve population. Crescent Valley: existing staff is not adequate to serve area.
Ambulance	Eureka County	16 emergency medical technicians	3 ambulances located in Crescent Valley	Crescent Valley communities; emergencies are transported to Elko General Hospital.	Existing facilities, equipment, and staff are adequate.

(Continued on next page)

Service Type	Agency	Description of Staff	Description of Facilities	Jurisdiction/Additional Areas Covered	Adequacy
Lander County					
Law Enforcement	Lander County Sheriff's Dept.	1 sheriff, 1 under sheriff 1 lieutenant 3 sergeants 13 deputy sheriffs 6 dispatchers 2 animal control officers 4 civilian staff members	Headquarters in Battle Mountain; 1 substation; 4-bed detention facility in Battle Mountain; transport longer-term inmates to Eureka, Winnemucca, or Lovelock; transport juveniles to Winnemucca facility.	Unincorporated Lander County, including Battle Mountain; participate in a mutual assist program with NHP and adjacent county sheriff's departments	Existing facilities are not adequate and the department contracts with Eureka and Humboldt counties for transport and confinement of prisoners.
Fire Protection	Battle Mountain Volunteer Fire Department	24 volunteer firefighters	1 station in Battle Mountain.; 3 engines; 2 pumpers; 1 aerial ladder; 4,000-gallon tanker truck.	Populated areas of Lander County, including the unincorporated town of Battle Mountain; will respond to emergencies 25 miles north, 55 miles south, 35 miles east, and 27 miles west of Battle Mountain; NDF and BLM fight wildland fires in rural areas.	Existing staff and equipment are adequate.
Ambulance	Battle Mountain Ambulance	20 volunteer EMTs	3 ambulances located in Battle Mountain	Lander County, including Battle Mountain; emergencies are transported to Battle Mountain General Hospital.	Existing facilities, equipment, and staff are adequate.

Sources: Personal communications with the following: Peggy Stewart, Elko County Sheriff's Department, Office Manager, March 31, 1998; Phyllis Breschini, Elko Police Department, Records Supervisor, March 31, 1998; Marilou Togmarelli, Carlin Police Department, Secretary, December 2, 1997; Cheryl Morrison, Eureka County Sheriff's Department, Department Assistant, December 2, 1997; Mike Kranovich, Lander County Sheriff's Department, Under Sheriff, December 2, 1997; Betty Smith, Nevada Division of Forestry, Management Assistant, March 27, 1998; Dave Davis, Fire Management Officer, BLM Battle Mountain Field Office, April 27, 1998; Verl Jarvie, Elko Fire Department, Fire Marshall, March 27, 1998; Mike Hecht, Nevada Division of Forestry, Firefighter, March 27, 1998; Mike Revaleati, Eureka Volunteer Fire Department, Fire Chief, January 13, 1998; Kevin Jackson, Crescent Valley Volunteer Fire Department, Chief, March 30, 1998; and Lee Killeen, Battle Mountain Volunteer Fire Department, Fire Safety Training Officer, March 30, 1998. Other references include JBR 1996; JBR 1997; and County of Eureka 1997.

full service facility for urgent care. Pioneer Urgent Care offers urgent care and occupational health services. Hi Tech Health Care Services offers home health care services.

The facilities, equipment, and staff in each of public and private medical establishments are adequate to serve the existing population within northeastern Nevada and as the community grows, the health department and private medical clinics have indicated that they will keep up with current demands (JBR 1996d).

There are no health care facilities established in the City of Carlin or in the community of Spring Creek. These residents rely on the medical, dental, and pharmaceutical facilities and services offered in the City of Elko.

Eureka County

There are no health care facilities established in Beowawe or Crescent Valley. Residents in these two communities rely on the medical, dental, and pharmaceutical facilities and services offered in Battle Mountain or Elko.

Eureka County maintains a senior center to support the seniors who live in the Crescent Valley. The senior center maintains a staff of three people and provides lunch to approximately 25 congregate and homebound participants. Additional services offered by this entity include providing assistance to people taking medications at home.

Lander County

Medical services in the town of Battle Mountain are provided primarily by the Battle Mountain General Hospital which serves north-central Nevada including the portions of the study area located in Lander and Eureka Counties. Battle Mountain General has an active medical staff of three doctors and maintains 34 patient beds. Patients with life threatening injuries are flown via Care Flight to Reno or Elko General for medical care.

Lander County also contributes to health care in Battle Mountain through its Public Health Department. This department offers limited preventative health services. Additional medical health services in the town of Battle Mountain are offered by the Nevada Home Health Service and the Battle Mountain Medical Clinic, a family practice that recently moved into the new expansion of the hospital.

Library and Recreational Facilities

Library services in the study area are provided by the Elko County Library which serves most of northeastern Nevada. The Elko County main library is located in the City of Elko. In addition, the Elko County Library provides the services of part-time librarians for branch libraries in Crescent Valley, Beowawe, and Battle Mountain on a contractual basis. The County also staffs a bookmobile which serves Carlin on a bi-weekly basis, as well as schools and rural areas. Existing library facilities in Elko are adequate to serve the existing population in northeastern Nevada (Personal communication, Loretta Jones, Elko County Library, Business Office, April 2, 1998). There is also a law library in the County Courthouse.

Recreational facilities found in the study area are described in Section 4.15.2.2.1.

Public Education

The Project study area is located within the service boundaries of several public school districts including the Elko County School District, Eureka County School District, and Lander County School District. In addition, there are universities, private schools, and other institutions that offer educational services in the Project study area that are documented in this section.

Elko County

The Elko County School District provides public educational services in both the incorporated and unincorporated areas of Elko County and is summarized in Table 4.16.11. Eight of the ten schools located within the Project study area are operating at or above capacity with student teacher ratios ranging from 13.84 to 18.16, with an average of 16.50. Table 4.16.12 summarizes historic district wide student enrollment and teaching staff, which shows that student teacher ratios for the district have ranged from 16.30 in 1994 to 15.35 in 1998, with an average of 15.77 in the past four school years. Of the 10,624 students in the Elko County School District, approximately of 3,000 are bussed to and from school daily. The district maintains approximately 51 buses, ranging in size from 12-passenger to 84-passenger vehicles (Personal communication, Leslie Zeiler, Elko County School District, Administrative Assistant, April 28, 1998).

Table 4.16.11: Enrollment, Capacity and Teaching Staff for Schools in the Elko County School District

School	Grades Served	Current Enrollment	Ultimate Capacity	Available Capacity	Number of Teachers	Student/ Teacher Ratio
Elko High School	9-12	1,327	1,300	-27	76	17.46
Spring Creek High School	9-12	735	850	115	36	18.16
Elko Junior High School	7-8	731	750	19	42	17.40
Spring Creek Middle School	7-8	654	650	-4	36	18.16
Northside Elementary School	K-6	663	500	-163	43	15.41
Southside Elementary School	K-6	720	600	-120	52	13.84
Mountain View Elem. School	K-6	838	750	-88	50	16.76
Carlin Combined School	K-12	553	650	97	37	14.94
Spring Creek Elem. School	K-6	835	650	-185	49	17.04
Sage Elementary School	K-6	587	587	at capacity [a]	37	15.86

[a] This school consists entirely of modular classrooms.

Source: Personal Communication, Mary Ann Kenley, Elko County School District, Secretary of the Superintendent, April 6, 1998.

In addition to the standard public educational services the following programs are available: (a) The Elko County School District adult high school program; (b) The University of Nevada Reno (UNR) and Great Basin Community College; and (c) Several private schools that provide alternative education opportunities.

Eureka County School District

The Eureka County School District provides public educational services in both the incorporated and unincorporated areas of Eureka County and is summarized in Table 4.16.13. All schools located within the district area are operating well below capacity with student teacher ratios ranging from 9.1 to 9.8, with an average of 9.5. Table 4.16.12 summarizes historic district wide information, which shows that student teacher ratios for the district have ranged from 10.1 in 1994 to 9.6 in 1997, with an average of 9.33 (Personal communication, Clarisse Herrera, Eureka County School District, December 5, 1998).

Of the 385 students in the Eureka County School District, an average of 250 are bused to and from school daily. The district maintains approximately 12 buses, ranging in size from 12-passenger to 84-passenger vehicles (Personal communication, Clarisse Herrera, Eureka County School District, December 5, 1998). In addition to the public educational services offered by the district, the Great Basin Community College system currently offers classes for adults in the community.

Lander County School District

The Lander County School District provides public educational services in both the incorporated and unincorporated areas of Lander County as summarized in Table 4.16.14. All existing schools located within the district area are operating well above capacity. Student teacher ratios range from 18.72 to 21.83, with an average of 20.04. The District is currently in the process of constructing Eleanor Lemaire Elementary School in Battle Mountain which will officially open in the fall of 1998. This elementary school will offer public education to grades 4-6 which will take pressure

Table 4.16.12: Historic Student Enrollment and Teaching Staff Levels in Study Area School Districts

	Elko County School District			Eureka County School District			Lander County School District		
Year	**Students**	**Teachers**	**Student/ Teacher Ratio**	**Students**	**Teachers**	**Student/ Teacher Ratio**	**Students**	**Teachers**	**Student/ Teacher Ratio**
1994-95	9,486	582	16.30	274	27	10.1	1,457	87	16.75
1995-96	9,853	635	15.52	308	33	9.3	1,553	87	17.85
1996-97	10,523	661	15.92	332	40	8.3	1,650	87	18.97
1997-98	10,624	692	15.35	385	40	9.6	1,777	87	20.43

Source: Personal Communication, Mary Ann Kenley, Elko County School District, Secretary of the Superintendent, April 6, 1998; Personal Communication, Clarisse Herrera, Eureka County School District, Personnel Coordinator, April 6, 1998; and Personal Communication, Mary Belton, Accounts Payable Clerk and Leon Hensley, Superintendent, Lander County School District, April 6, 1998.

off of the junior high school and three elementary schools located in Battle Mountain.

Table 4.16.12 summarizes historic information and shows that student teacher ratios for the district have ranged from 16.75 in 1994 to 20.43 in 1998, with an average of 18.50.

Of the 1,777 students in the Lander County School District, an average of 245 are bussed to and from school daily. The district maintains approximately 16 buses, ranging in size from 12-passenger to 84-passenger vehicles (Personal Communication, Mary Belton, Superintendent, Lander County School District, Accounts Payable Clerk, December 5, 1997). Additional educational services include: the Lander County School District adult diploma program and the Great Basin Community College.

4.16.2.2.5 Public Finance

Forms of Government

In Nevada, the powers of local governments are established by statute, subject to change by the state legislature. County governments are created directly by the state legislature. City governments may be established by general law or special charter. Special districts are the most common form of local government in the state. The state constitution does not reserve any governmental authority to either county or city governments. Counties and cities share a similar range of governmental authority including: general police powers, control of land use, and health, welfare, and recreation responsibilities. Counties have additional powers including property assessment courts, tax collections, and administration of special licenses. Although counties maintain land use and tax rate functions, unincorporated towns may, with county approval, take on most functions of city government (Ebel 1990).

Elko County

The state Legislature created Elko County, the sixth largest county in the U.S., from part of Lander County in 1869. Elko County is governed by a five-member Board of County Commissioners, each elected to a four-year term. The Board of County Commissioners appoints a seven-member planning commission. The County Commissioners oversee county operations, including administration, law enforcement, judicial, public works, and economic development. The county school district serves the entire county and is governed by an elected board, with the superintendent and administration responsible for day-to-day operations. The City of Elko incorporated in 1917 and has a council-manager form of government. A mayor and four supervisors are elected to four-year terms, while the city manager and other municipal officials are

Table 4.16.13: Enrollment, Capacity and Teaching Staff for Schools in the Eureka County School District

School	Grades Served	Current Enrollment	Ultimate Capacity	Available Capacity	Number of Teachers	Student/ Teacher Ratio
Eureka County Jr./Sr. High School	7-12	157	200	55	16	9.8
Eureka County Elementary School	K-6	137	240	85	14	9.7
Crescent Valley Elementary School	K-6	91	180	89	10	9.1

Source: Personal Communication, Clarisse Herrera and Bob Cox, Eureka County School District, December 5, 1997.

appointed by the city council. The City of Carlin incorporated in 1971 and has a mayor-council form of government. The mayor, vice mayor, and four council members are each elected to four-year terms. The city clerk, police chief and public works director are appointed by the city council.

Eureka County

The primary governing bodies in Eureka County are the Board of County Commissioners and the Eureka County School District. The County Commissioners oversee county operations, including administration, law enforcement, judicial, public works, and economic development. The County also administers the budgets of the Town of Eureka, Town of Crescent Valley, and various special districts. The county school district serves the entire county and is governed by an elected board, with the superintendent and administration responsible for day-to-day operations. The Town of Crescent Valley is governed by the Crescent Valley Town Board. Beowawe is unincorporated and governed by the Eureka County Board of Commissioners.

Lander County

Lander County is governed by a three-member Board of Commissioners, each elected to a four-year term. A seven-member planning commission, public administrator, and budget director are appointed to serve the region. The county commissioners administer the following services and properties: fire protection, roads, recreational facilities, library, water, wastewater, and planning. The county school district serves the entire county and is governed by an elected board, with the superintendent and administration responsible for day-to-day operations. Battle Mountain is unincorporated and receives administrative services from Lander County.

<u>Current Fiscal Condition</u>

Public finances in Nevada include locally derived and state-shared revenues. Locally derived finances consist of ad valorem property taxes on real and personal property and the net proceeds of mines located within the county. state-shared revenues include sales, motor vehicle, fuel, and gaming revenues. Intergovernmental transfers have become important because of economic disparities between metropolitan areas of Clark and Washoe counties and rural agricultural and mining counties.

Table 4.16.15 presents the actual budget revenues and expenditures for 1996 and estimated budget revenues and expenditures for 1997 for each study area county. As shown in Table 4.16.15, Eureka and Lander Counties have similar sources of revenue. Both counties are very reliant on tax revenue and intergovernmental transfers. Tax revenues declined in both counties between Fiscal Year (FY) 1996 and FY 1997, while intergovernmental transfers increased to 49 and 61 percent of revenues in Eureka and Lander County, respectively. In contrast, Elko County demonstrated less reliance on tax revenues, but nearly the same dependancy on intergovernmental transfers as spent a smaller proportion of its budget on general government, and a substantially greater proportion on

Table 4.16.14: Enrollment, Capacity and Teaching Staff for Schools in the Lander County School District

School	Grades Served	Current Enrollment	Ultimate Capacity	Available Capacity	Number of Teachers	Student/ Teacher Ratio
Battle Mountain High School	9-12	412	350	-62	22	18.72
Battle Mountain Junior High	6-8	390	200	-190	19	20.52
Mary Black Elementary School	3-5	393	250	-143	18	21.83
Eliza Pierce Elementary School	K-2	535	150	-385	28	19.10

Source: Personal Communication, Mary Belton, Superintendent, Lander County School District, Accounts Payable Clerk and Leon Hensley, December 5, 1997.

judicial costs. The greatest portion of Elko's budget was spent on public works in FY 1997. Elko County had the highest debt service expenditure - five percent, compared to three and zero percent for Lander and Eureka Counties, respectively.

Tax Revenue from Mining

The state and local governments receive revenue from mining in these two ways: a tax on net proceeds of mineral operations and property tax on mining-related property. The tax on mining proceeds is constitutionally-mandated. Net proceeds are calculated by subtracting certain deductions from the gross yield of mining production. Deductions include the costs of extraction, transportation to mill, reduction and refining, marketing, and insurance, as well as depreciation of the plant, machinery, and equipment and royalties paid. Until 1987, all mining tax receipts on net proceeds were allocated to local governments. Currently, the state may tax up to five percent on net proceeds and subsequently distributes tax receipts to the counties on the basis of their ad valorem tax rate. Current ad valorem tax rates (FY 1997-98) for the study area counties are 2.4817 in Elko, 1.6973 in Eureka, and 3.3913 in Lander (Nevada Department of Taxation 1997). The maximum state share of net proceeds is approximately 60 percent (Ebel 1990). As shown in Table 4.16.16, the assessed valuation of net proceeds has recently dropped for FY 1996-97 in Eureka and Lander Counties. Despite the decline, these counties continue to have the highest and third highest assessed valuation of net proceeds in the state. Between FY 1995-96 and FY 1996-97, the assessed valuation dropped nearly 25 percent in Eureka County and nearly 60 percent in Lander County, while during the same period increased 135 percent in Elko County. Tax revenue from mining in Elko County dropped sharply during FY 1995-96 but recovered to its previous level during FY 1996-97. In contrast, Eureka County lost 20 percent of its tax revenue from mining in FY 1996-97, following a slight rise the previous fiscal year. Lander County, after a slight loss in FY 1995-96, experienced a sharp drop in revenue from mining, losing nearly 55 percent of revenue in FY 1996-97.

The net assessed value (gross assessed value less exemptions) of mining-related property in each county is shown in Table 4.16.17. Both Elko and Eureka Counties have recently experienced a decline in the value of mining-related real and personal property of approximately 43 and 27 percent, respectively. However, the valuation of mining-related property in Elko County represents a smaller share of the county's total property value than in the other study area counties (only nine percent of total property value in FY 1997-98 compared to nearly 94 and 67 percent in Eureka and Lander Counties, respectively). In contrast to the declines in mining-related property values in Elko and Eureka Counties, Lander County experienced a substantial gain in value between FY 1995-96 and FY 1996-97 (nearly 36 percent), and continued to gain through FY 1997-98.

Table 4.16.15: Revenues and Expenditures in Study Area Counties, 1996 and 1997 (in dollars)

	Elko County				Eureka County				Lander County			
Revenues/Expenditures	1996	% of Total	1997	% of Total	1996	% of Total	1997	% of Total	1996	% of Total	1997	% of Total
Revenues												
Taxes (Property and Other)	5,081,220	22%	5,789,356	23%	8,253,810	50%	4,906,515	36%	3,850,328	40%	4,101,178	29%
Licenses and Permits	765,129	3%	762,100	3%	16,449	0%	13,244	0%	209,759	2%	155,902	1%
Intergovernmental Resources	12,733,136	55%	14,618,594	57%	6,694,763	40%	6,652,376	49%	4,343,354	45%	8,718,290	61%
Charges for Services	2,085,137	9%	1,860,319	7%	729,567	4%	495,264	4%	504,859	5%	570,958	4%
Fines and Forfeits	1,243,189	5%	1,333,800	5%	97,687	1%	80,836	1%	248,532	3%	251,000	2%
Miscellaneous Revenues	1,423,558	6%	1,130,520	4%	809,117	5%	1,392,692	10%	485,027	5%	554,029	4%
Total Revenues	23,331,369	100%	25,494,689	100%	16,601,393	100%	13,540,927	100%	9,641,859	100%	14,351,357	100%
Expenditures												
General Government	5,136,714	22%	7,846,227	23%	5,339,196	39%	5,239,827	35%	2,894,604	30%	3,423,696	32%
Judicial	4,549,252	20%	5,954,283	18%	522,872	4%	527,794	3%	991,876	10%	1,113,885	10%
Public Safety	5,705,247	24%	5,527,827	16%	1,610,871	12%	1,567,953	10%	2,239,806	23%	2,694,115	25%
Public Works	3,707,211	16%	9,439,071	28%	3,548,508	26%	3,532,379	23%	1,577,807	17%	1,728,811	16%
Health and Sanitation	307,120	1%	170,852	1%	671,961	5%	1,103,227	7%	193,578	2%	70,220	1%
Welfare	1,092,303	5%	1,474,731	4%	0	0%	0	0%	334,472	4%	454,289	4%
Culture and Recreation	1,307,275	6%	1,519,262	4%	671,667	5%	655,679	4%	859,647	9%	812,868	8%
Community Support	307,798	1%	200,633	1%	369,087	3%	1,019,807	7%	45,823	0%	55,178	1%
Intergovernmental Expenditures	145,067	1%	155,458	0%	1,077,663	8%	1,449,485	10%	86,902	1%	95,044	1%
Debt Service (Principal plus Interest)	1,054,707	5%	1,656,415	5%	0	0%	0	0%	312,897	3%	278,092	3%
Total Expenditures	23,312,694	100%	33,944,759	100%	13,811,825	100%	15,096,151	100%	9,537,412	100%	10,726,198	100%
Excess (Deficiency) of Revenues Over Expenditures	18,675		(8,450,070)		2,789,568		(1,555,224)		(9,537,412)		(10,726,198)	

Source: County of Elko 1997; County of Eureka 1997; and County of Lander 1997.

Table 4.16.16: Assessed Valuation and Tax Revenue Distribution of Net Proceeds of Minerals by Study Area County

County		Fiscal Year		
		1994-95	1995-96	1996-97
Elko	Assessed Valuation	$17,537,908	$9,132,318	$21,501,161
	Tax Revenue Distribution	$509,711	$222,903	$502,492
Eureka	Assessed Valuation	$465,812,474	$474,563,434	$357,833,953
	Tax Revenue Distribution	$6,558,781	$6,984,374	$5,536,408
Lander	Assessed Valuation	$88,373,027	$92,741,822	$37,698,138
	Tax Revenue Distribution	$2,693,426	$2,494,388	$1,140,404

Source: Nevada Department of Taxation 1997b; Nevada Department of Taxation 1996; and Nevada Department of Taxation 1995.

4.16.3 Environmental Consequences and Mitigation Measures

4.16.3.1 Significance Criteria

NEPA (Section 1508.14) states that *"...economic or social effects are not intended by themselves to require preparation of an environmental impact statement. When an environmental impact statement is prepared and economic or social and natural or physical environmental effects are interrelated, then the environmental impact statement will discuss all of these effects on the human environment."* Simply put, this means that social or economic differences are not enough to result in a potentially significant adverse effect, but they need to manifest themselves with some physical change, as described in NEPA (Section 1508.8(b)), *"...effects may include growth inducing impacts and other effects related to induced changes in the pattern of land use, population density or growth rate".*

As identified during the scoping process and from the Pipeline project FEIS (BLM 1996a; pages 4-54 through 4-56), the Proposed Action would normally have a significant effect on the environment if the following would occur:

- Induce substantial growth or concentration of population;
- Displace a large number of people;
- Cause a substantial reduction in employment;
- Substantially reduce wage and salary earnings;
- Cause a substantial net increase in County expenditures; or
- Create a substantial demand for public services.

4.16.3.2 Assessment Methodology

The expected requirements of the Project in terms of employment, housing, and public services would be compared to the socioeconomic characteristics of the study area counties and communities. Fiscal effects of the Project would be discussed based on information obtained from Elko, Eureka, and Lander Counties.

4.16.3.3 Proposed Action

The Proposed Action would extend the operational life of CGM's mining and processing activities, as well as the current employment of 450-500 individuals by approximately eight The life of the Proposed Action would total approximately 18 years (through 2016). The South Pipeline ore deposit would account for an additional eight years of mining and two years of processing beyond the eight years of mining and processing outlined in the Pipeline FEIS (BLM 1996a;

Table 4.16.17: Mining-Related Real and Personal Property Valuation as a Percentage of Total Property in the Study Area Counties

	Mining-Related Real and Personal Property Valuation						Percent Change	
County	FY 1995-96	% of Total Property Value	FY 1996-97	% of Total Property Value	FY 1997-98	% of Total Property Value	FY 95/96 - FY 96/97	FY 96/97 - FY 97/98
Elko	$107,185,880	15.6%	$99,938,080	13.5%	$56,902,860	9.0%	-6.8%	-43.1%
Eureka	$551,129,410	59.7%	$563,655,040	65.0%	$409,115,213	93.6%	2.3%	-27.4%
Lander	$81,023,290	31.7%	$110,032,800	48.2%	$115,781,175	66.8%	35.8%	5.2%

Source: FY 1995-96 and FY 1996-97 from Nevada Department of Taxation 1997b; FY 1997-98 information from County Assessor's Statistical Analysis of the Roll - Secured (FY 1997-98) and Unsecured (FY 1996-97) Real and Personal Property.

page 2-9). As described in Section 3.6.2, it is estimated that up to 50 contractors would be working on the Project Area at any time during the life of the Project. A temporary construction work force is not anticipated to be necessary, except during periods of pad construction or advance pre-stripping of the open pit. The majority of current employees would continue to be transported by bus to the Project site each day. CGM does not intend to build construction camp living facilities at or near the Project Area. Although additional permanent employees are not expected to be necessary, CGM would hire any new personnel from the local area if possible.

4.16.3.3.1 Environmental Consequences and Mitigation Measures

Population Effects

Because the Proposed Action would utilize the existing permanent CGM work force, the Proposed Action would not impact the population of the study area beyond existing conditions under the Pipeline project. The Proposed Action may have up to 50 contractors on site at any time during the life of the Project; however, the impact of contractors or temporary construction personnel on the population of the study area is short-term and not considered significant. As described in Section 4.16.2.2.1, CGM employees make up a significant portion of the Beowawe/Crescent Valley population. The Proposed Action would have a beneficial effect of maintaining population stability in the study area, particularly in Beowawe and Crescent Valley, by providing an additional eight years of employment to current staff (450-500 employees). By utilizing the existing CGM work force, the Project would not induce substantial growth or concentration of population and would not create a substantial demand for public services. The Partial Backfill, Injection, and Water Delivery to Private Land options do not otherwise impact population effects.

▣ **Impact 4.16.3.3.1-1:** The Project would continue employment of CGM's existing work force for an additional eight years, thus maintaining population stability in the study area, particularly Beowawe and Crescent Valley.

Significance of the Impact: This would be a beneficial impact of the Project, and no mitigation measures are required.

Employment Effects

It is likely that the 50 contractors and short-term construction personnel would be selected from the study area. Review of Table 4.16.6 reveals that the study area counties and communities could each accommodate the 50 workers in whatever industry that they may be employed.

As described in Section 4.16.2.2.2, unemployment levels in the study area were higher than the state average in 1997 and have been rising due to the recent decline in the price of gold and subsequent layoffs in the mining industry. It is expected that the continued employment of 450-500 workers by the Proposed Action would be welcome in an area facing shrinking job opportunities and growing unemployment. In particular, at least eight years of continued employment in the mining industry, one the highest paying industries in the study area, would be a positive benefit to the study area.

In addition, the Proposed Action would have an indirect positive impact on study area employment. Based on the current employment of 456 workers and using an employment multiplier of 1.25 (Dobra 1989), a total employment impact of 1,026 jobs, or 570 additional jobs, would continue as a result of the Proposed Action. Of these 570 indirect jobs, 342 jobs in the local economy and 228 jobs in the urban service and supply centers of Nevada would continue under the Proposed Action. Similarly, using the 1998 monthly payroll of $1.9 million and the income multiplier of 1.57 (Dobra 1989), an estimated annual indirect payroll of $13.2 would continue for at least eight years as a result of the Proposed Action.

Both direct and indirect employment would continue through approximately 2016. Workers and their families would continue to enjoy the same quality of life and would continue to spend disposable income at local business in the study area through that time. As estimated in Section 4.16.2.2.2, CGM's existing payroll generates approximately $16 million in direct disposable income annually, which in turn generates an additional $25 million of indirect disposable income spent annually throughout the study area and the state. The Partial Backfill, Injection, and Water Delivery to Private Land options do not otherwise impact employment effects.

- **Impact 4.16.3.3.1-2:** The Project may employ up to 50 short-term contractors or construction personnel during the life of the Project and would continue long-term employment for the existing CGM work force (450-500). It is expected that temporary and/or potential long-term employment positions could be accommodated by the study area population and there would not be a need to import employees from outside of the study area. The Project would continue to employ current CGM employees for an additional eight years, resulting in a continuance of current indirect employment, as well as direct and indirect spending in the study area and the state.

  Significance of the Impact: These would be beneficial impacts of the Project. No adverse impact due to increased short-term and continued long-term employment opportunities would be expected, and no mitigation measures are required.

<u>Housing Effects</u>

Assuming the employment analysis is correct in determining that the study area has a sufficient resident population in the needed industry classifications to meet the demand for approximately 50 contractors during the life of the Project, it is likely that many of the workers would commute to the Project site. Nonetheless, for this analysis, it is assumed that 50 rental residences would be needed. From Table 4.16.9, 13 percent or 1,750 housing units were vacant in Elko County when the U.S. Census was taken; 24 percent or 196 housing units were vacant in Eureka County; and 14 percent or 362 housing units were vacant in Lander County. Assuming the occupancies follow the county proportions for renter-occupied versus owner-occupied housing units (31 percent renter occupied in Elko County; 24 percent renter occupied in Eureka County; and 25 percent renter occupied in Lander County), this would result in approximately 543 housing units in Elko County, 47 housing units in Eureka County, and 91 housing units in Lander County being rentals. In addition to these vacant housing units, there is a temporary housing in hotel/motels and RV parks available throughout the study area. Based on the availability of vacant housing in the Study Area and the likelihood that many contractors would be able to commute to the work site, it is not expected that a shortage of housing would result.

Continued employment of existing CGM employees through 2016 may cause some employees that have been renting to purchase a housing unit in the study area. This is not expected to affect housing availability in the study area. The Partial Backfill, Injection, and Water Delivery to Private Land options do not otherwise impact housing effects.

- **Impact 4.16.3.3.1-3:** The Project may increase demand for local rental housing. It is expected that the demand can be accommodated with existing housing supply.

  Significance of the Impact: This would be a beneficial impact of the Project as housing

vacancy levels for the study area counties and communities exceed the state average. No mitigation measures are required.

Public Services Effects

Because the Proposed Action would not induce growth in the study area, it would not create additional demand for public services. Public services such as utility services (water, sewage, and solid waste), emergency services, health care and social services, library and recreational facilities, and educational facilities would only be affected by the Project by the additional length of time (eight years) that CGM employees would require public services. Following the large increase in study area population during the 1980s (discussed in Section 4.16.2.2.1), county and local governments increased and expanded public services to meet growth. Although some of the service providers expressed the need for more staff or facilities, most public services were determined to be adequate to meet the needs of their respective service areas (see Section 4.16.2.2.4). As discussed in Section 4.16.2.2.1, population growth in the study area is expected to slow over the next decade. The extent of the slowdown will depend on the future of mining in the study area and the success of study area economies in diversifying. Public service providers in the study area should be able to continue to meet the needs of current residents, including existing CGM employees, through the life of the Project because of the lower population growth expected.

Fiscal Effects

Under the Proposed Action, an additional 150 million tons of ore would be mined in the Project Area. This additional gold production capacity translates into increased gross yield from mining production in Lander County, and subsequently, increased taxable net proceeds. The latest breakdown of net proceeds by individual mining operation (1995) showed that CGM paid approximately 11 percent of the total taxes on net proceeds and was the second-largest producer in Lander County (Personal Communication, Tom Gransbery, Assessment Standards, Nevada Department of Taxation, April 20, 1998). The Proposed Action would result in the continuation of, and potential increase in, CGM's tax contribution to Lander County from net proceeds. In addition, development of the Proposed Action would increase the value of CGM's real and personal mining property, thus increasing the amount of property taxes paid to Lander County. As discussed in Section 4.16.2.2.5, tax revenues as a proportion of Lander County's total revenues, decreased between FY 1996 and FY 1997, from 40 to 29 percent of revenues, increasing the County's reliance on intergovernmental transfers. As shown in Table 4.16.6, Lander County lost approximately $55 million in the assessed value of the net proceeds of minerals between FY 1995-96 and FY 1996-97, likely the result of scaled-back operations at Battle Mountain Gold during the period. This drop in assessed valuation resulted in an almost 55 percent loss of tax revenue from net proceeds. Implementation of the Project would have the beneficial impact of preventing another significant drop in the net proceeds tax revenue by extending the producing life of CGM's operations by 10 years.

Although Elko and Eureka Counties would not receive mining-related increased tax revenues from the Proposed Action, these counties are affected because the majority of CGM employees reside in their communities. Both counties began carrying a budget deficit in 1997 (see Table 4.16.15). The increase in revenue for Elko County (nine percent) did not keep pace with the increase in expenditures (45 percent) between FY 1996 and FY 1997, thus resulting in an approximately $8.5 million deficit. Eureka County experienced a 19 percent drop in revenues for the period, while expenditures rose approximately nine percent - resulting in a deficit of $1.6 million. While the Proposed Action would not increase the number of long-term residents in the study area requiring government services, the Project would extend the residency period of 450-500 CGM employees by eight years. This would mean a continued strain on the public finances of Elko and Eureka Counties where 66 and 21 percent of current employees reside. However, CGM employees residing in Elko and Eureka Counties represent a very small percentage of each counties' total population; therefore, the impact on public finance in these counties is not considered significant. In addition the effects of the continued presence of CGM employees on Elko and Eureka County expenditures is likely offset by the taxes paid by these residents who are typically the highest-earning in the study area (i.e., property and sales taxes), as well as other revenue generated from county residents (i.e., service fees, license and permit fees, etc.). The Partial Backfill, Injection, and Water Delivery to Private Land options do not otherwise impact public service and fiscal effects.

▣ **Impact 4.16.3.3.1-4:** The Project would result in a continuation of and a potential increase in

revenues for the State of Nevada and Lander County.

Significance of the Impact: This would be a beneficial impact of the Project. No adverse impact due to continued and increased revenue would be expected, and no mitigation measures are required.

4.16.3.3.2 Residual Adverse Impacts

There would be no residual adverse effects associated with socioeconomic values and public services.

4.16.3.4 Pipeline Backfill Alternative

Socioeconomic and public service impacts from the Pipeline Open Pit Backfill Alternative are identical to those described for the Proposed Action. The Pipeline Open Pit Backfill Alternative would require the same number of short-term contractors (up to 50) as the Proposed Action and would continue to employ the 450-500 existing CGM employees for an additional eight years beyond the Pipeline project.

4.16.3.4.1 Environmental Consequences and Mitigation Measures

The impacts, statements of significance, and mitigation for the Pipeline Backfill Alternative are identical to those presented for the Proposed Action in the previous section. The discussion of the socioeconomic and public service effects of the Proposed Action are relevant to this alternative.

4.16.3.4.2 Residual Adverse Impacts

There would be no residual adverse effects associated with socioeconomic values and public services.

4.16.3.5 No Action Alternative

Under the No Action Alternative, the Proposed Action would not be implemented. As a result, current CGM employees would not continue employment beyond the Pipeline project.

4.16.3.5.1 Environmental Consequences and Mitigation Measures

The No Action Alternative would result in the loss of the beneficial socioeconomic effects associated with the Project described under the Proposed Action. Current employment at CGM's operation would cease with the termination of the Pipeline project, thus causing a reduction of employment eight years earlier than under the Proposed Action.

▣ **Impact 4.16.3.5-1:** The No Action Alternative would result in the elimination of up to eight additional years of payroll for 450-500 CGM employees and a local and state tax base.

Significance of the Impact: This impact is considered significant, and no mitigation measures appear feasible.

4.16.3.5.2 Residual Adverse Impacts

The loss of potential beneficial socioeconomic impacts associated with the Project would be residual adverse impacts by the No Action Alternative. These impacts include the following: (a) increased population stability in the study area, particularly Beowawe and Crescent Valley; (b) continued and increased employment opportunities; (c) increased demand for local housing; and (d) continued and increased revenues for the state and Lander County. The reduction of employment eight years earlier under the No Action Alternative would be a residual adverse impact to socioeconomic values. The Pipeline project FEIS did not identify any unavoidable adverse effects for socioeconomic values or public services (BLM 1996a; pages 4-66 through 4-67).

4.17 Environmental Justice Effects

4.17.1 Regulatory Framework

On February 11, 1994, President William Clinton issued Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations.* This Executive Order was designed to focus the attention of federal agencies on the human health and environmental conditions in minority communities and low-income communities. In an accompanying Presidential memorandum, the President emphasized that existing laws, including NEPA, provide opportunities for federal agencies to address environmental hazards in minority and low-income communities. In April of 1995, the EPA released the document titled *Environmental Justice Strategy: Executive Order 12898.* The document established EPA-wide goals and defined the approaches by which EPA would ensure that disproportionately high and adverse human health or environmental effects on minority communities and low-income communities are identified and addressed.

4.17.2 Affected Environment

4.17.2.1 Study Methods

The baseline data presented below is based upon information from the Pipeline Project FEIS (BLM 1996a; pages 3-45 through 3-52) and its precursor, the Cortez Gold Mine Expansion Project DEIS (BLM 1992; pages 3-47 through 3-51). Discussions of existing socioeconomics are incorporated by reference. New and supplemental socioeconomic data information obtained from a variety of state and federal sources including the 1990 U.S. Census; U.S. Department of Commerce, Bureau of Economic Affairs; and the Nevada state Demographer has been added.

The study area for environmental justice effects includes the Project Area, as well as portions of Elko, Eureka, and Lander Counties. As discussed in the Pipeline project FEIS, this study area was defined based on the fact that employees may live up to 70 miles from the Project Area, with approximately 55 percent living in the Elko/Spring Creek area, 21 percent in Crescent Valley and Beowawe, 14 percent in Battle Mountain, and 11 percent in Carlin (see Section 3.6.2).

4.17.2.2 Existing Conditions

4.17.2.2.1 Minority Population

Table 4.16.3 summarizes the ethnic composition of study area counties and communities and the State of Nevada. Most notable is the higher percentage of American Indian, Eskimo, or Aleut in the study area compared to the State of Nevada. For Nevada, the American Indian, Eskimo, or Aleut population constituted approximately two percent of the total. However, in the study area, the percentages were six, five, and four percent for Elko County, Lander County, and Battle Mountain respectively. The percentage of American Indians within the American Indian, Eskimo or Aleut grouping were 100, 100, and 100 respectively.

In accordance with EPA's Environmental Justice Guidelines (EPA 1998), these minority populations should be identified when either:

- The minority population of the affected area exceeds 50 percent; or
- The minority population of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis.

Although the population of American Indians does not exceed 50 percent, the population of American Indians occurring in portions of the study area is "meaningfully greater" than the minority population in the general population, in this case, the State of Nevada. Therefore, for the purposes of screening for environmental justice concerns, a minority population, as defined in EPA's guidance (EPA 1998), exists within the study area.

The White population in the study area is also much higher than for the State of Nevada, with the study area counties (except Elko) and communities each having White populations that comprise more than 90 percent of the total population. In comparison, the State of Nevada has a White population comprising 84 percent of the total. However, the study area has much lower populations of Blacks and Asian or Pacific Islanders compared to the State of Nevada. Although the remainder of the study area has a comparable or lower proportion of Other Race than the state, Elko County and Elko/Spring Creek each have a two percent higher proportion of Other Race, consisting primarily of persons of Hispanic origin. This population is not considered "meaningfully greater" than the minority population in the general population and is not considered a minority population as defined in EPA's guidance (EPA 1998).

4.17.2.2.2 Low-Income Population

The median incomes for the population living in the study area are substantially higher than those in the State of Nevada (see Table 4.16.4). Analysis of the percentage of persons below the poverty level in each race classification for the State of Nevada and study area counties and communities reveals that a higher incidence of poverty tended to occur for all nationalities but Asian or Pacific Islander in most of the local jurisdictions (see Table 4.16.5). However, of any significant ethnic population in the study area, the incidence of poverty tended to be higher for the American Indian, Eskimo, or Aleut population living in Carlin, Lander County, and Battle Mountain. The percentage of American Indians within the American Indian, Eskimo, or Aleut grouping in Carlin, Lander County, and Battle Mountain were 93, 100, and 100, respectively. Lander County, where the Project is planned to be located, also had the lowest per capita income of the study area. This data indicates that American Indians are a low-income population group, as defined in EPA's guidance (EPA 1998), for the purposes of screening for environmental justice concerns.

4.17.3 Environmental Consequences and Mitigation Measures

4.17.3.1 Significance Criteria

EPAs' *Guidance For Incorporating Environmental Justice Concerns in EPA's NEPA Compliance Analyses* (EPA 1998) suggests a screening process to identify environmental justice concerns. This two-step process defines the significance criteria for this issue; if either criteria is unmet, there is little likelihood of environmental justice effects occurring. The two-step process is as follows:

(1) Does the potentially affected community include minority and/or low-income populations?

(2) Are the environmental impacts likely to fall disproportionately on minority and/or low-income members of the community and/or tribal resource?

If the two-step process discussed under *Study Methods* indicates that there exists a potential for environment justice effects to occur, the following analyses are conducted to consider the following:

- Whether there exists a potential for disproportionate risk of high and adverse human health or environmental effects;
- Whether communities have been sufficiently involved in the decision-making process; and
- Whether communities currently suffer, or have historically suffered, from environmental and health risks and hazards.

4.17.3.2 Assessment Methodology

The socioeconomic characteristics of the study area counties and communities are first analyzed for the presences of minority and/or low-income populations. Second, if minority and/or low income populations are identified based on EPA's *Environmental Justice Guidelines* (EPA 1998), the project and alternatives are evaluated for potential effects which may be expected to disproportionally impact any such populations. If the Two-step process above indicates that a potential for environmental justice effects exists, additional analyses under the significance criteria are then applied to determine if the adverse effects would be considered significant impacts if the Project or an alternative were implemented.

4.17.3.3 Proposed Action

4.17.3.3.1 Environmental Consequences and Mitigation Measures

Initial analysis concluded that the potential effects of the Project are not expected to disproportionately affect any particular population. The area in the immediate vicinity of the proposed Project is sparsely inhabited, the nearest residence located approximately 5 miles to the southwest. The nearest residential area is located in the town of Crescent Valley, approximately 13 miles northeast of the Project Area. Crescent Valley does not have an unusually high minority or low-income population, but does have a substantially greater proportion of Whites compared to the rest of the study area and the state (see Table 4.16.3). Environmental effects that may occur at a greater distance, such as auditory resource or air impacts, would affect the area's population equally, without regard to nationality or income level.

However, a second provision of this criteria requires consideration of "impacts that may affect a cultural, historical, or protected resource of value to an Indian Tribe or a minority population, even when the population is not concentrated in the vicinity." According to Section 4.11, no traditional cultural properties or E.O. 13007 sites have been identified within the Project Area that might be impacted by the Proposed Action or either of the alternatives. Therefore, there are no impacts associated with the Proposed Action on traditional Native American religious concerns. In anticipation of Native American concerns, Native American Consultation was initiated during the scoping process as described in Section 1.6. This is consistent with the guidance provided by EPA (EPA 1998) to ensure that Native American concerns are identified and evaluated.

On the basis of the second part of the criteria, the Project would not result in a disproportionate effect on a minority population. Because there is no disproportionate effect on an identified minority population as a result of the Proposed Action, no further environmental justice analyses are required. The Partial Backfill, Injection, and Water Delivery to Private Land options do not otherwise impact environmental justice.

4.17.3.3.2 Residual Adverse Impacts

There are no residual adverse impacts associated with the Proposed Action.

4.17.3.4 Pipeline Backfill Alternative

4.17.3.4.1 Environmental Consequences and Mitigation Measures

No traditional cultural properties or E.O. 13007 sites have been identified in the Project Area that might be. impacted by the Pipeline Backfill Alternative. Therefore, there are no environmental justice impacts associated with the Backfill Alternative.

4.17.3.4.2 Residual Adverse Impacts

There are no residual adverse impacts associated with the Pipeline Backfill Alternative.

4.17.3.5 No Action Alternative

4.17.3.5.1 Environmental Consequences and Mitigation Measures

There are no environmental justice impacts associated with the No Action Alternative.

4.17.3.5.2 Residual Adverse Impacts

There are no residual adverse impacts associated with the No Action Alternative.

4.18 Paleontology

This section summarizes the assessment of the paleontological resources within the Project, the potential impact of the Proposed Action and the Alternatives and the federal regulations associated with the collection of paleontological resources.

4.18.1 Regulatory Framework

The BLM regulates the collection of fossils on public lands under its jurisdiction under the following laws and regulations: The Federal Land Policy and Management Act (FLPMA), Section 310 and 302(b); 43 CFR 8365.1-5; and 43 CFR 3622. These laws provide direction on what individuals may do who wish to collect fossils on public land. Other federal agencies have similar authorities and policies for the lands they administer.

4.18.1.1 The Federal Land Policy and Management Act

Included in the many charges given to the BLM by FLPMA are the following items: (a) to manage the public lands in such a manner that protects the quality of scientific and other values, (b) to see that these lands and resources are periodically and systematically inventoried, (c) to use such inventory data in developing plans for the management of these lands, and (d) to manage the use of such lands and resources through easements, licenses and permits.

4.18.1.2 BLM Regulations 43 CFR 8365.1-5

Subject to the provisions of this regulation, common invertebrate and paleobotanical fossils may be collected in reasonable amounts for noncommercial purposes, without a permit. However, in order to protect significant localities, areas my be closed to the collection of invertebrate and paleobotanical fossils except under permit. Vertebrate fossils - dinosaur bones, fish, footprints et cetera - may only be collected under a permit. BLM issues permits to qualified paleontologists who agree to put their collections into repositories where they remain the property of the federal government and are accessible for study, education, and public enjoyment.

4.18.1.3 BLM Regulations 43 CFR 3622

Subject to the provisions of this regulation, persons may collect up to 25 pounds plus one piece per person per day of petrified wood, up to a maximum of 250 pounds in one calendar year, for personal, noncommercial purposes without a permit.

4.18.2 Affected Environment

4.18.2.1 Study Methods

An assessment of paleontological resources was conducted through the examination of inventories prepared by the BLM and a review of the literature. The results of this assessment are detailed in the Pipeline project DEIS (BLM 1996a; Appendix A; pages A3 through A16). Due to the discovery of a mammoth tusk in the Project Area after the assessment was completed, the BLM was contacted and a follow-up field survey of the vertebrate local was conducted.

4.18.2.2 Existing Conditions

No known invertebrate localities were found within the Project area. Subsequent to the assessment prepared for the Pipeline DEIS, a mammoth tusk was discovered in the study area by CGM during a permitted gravel-quarrying operation. The BLM was contacted and the fossil was transported to the University of Nevada-

Reno where it was found to be of little paleontological significance. No other vertebrate localities were found.

4.18.3 Environmental Consequences and Mitigation Measures

4.18.3.1 Significance Criteria

The Project would have a significant effect on the environment if there were sensitive paleontological resources within the Project Area.

4.18.3.2 Assessment Methodology

In assessing the impacts of the Proposed Action and Project Alternatives, a literature research was conducted and recorded locality lists were searched for sensitive paleontological resources within the Project Area. A complete ground survey was conducted within the area of the mammoth tusk discovery and the tusk was sent to the University of Nevada-Reno for detailed identification.

4.18.3.3 Proposed Action

4.18.3.3.1 Environmental Consequences and Mitigation Measures

The Proposed Action consists of many activities including construction, which could have an effect on an area containing sensitive paleontological resources. The Partial Backfill, Injection, and Water Delivery to Private Land options do not otherwise impact paleontological resources.

- **Impact 4.18.3.3.1-1:** During construction phases, the possibility exists that additional vertebrate fossils could be found.

  Significance of Impact: This impact is considered less than significant and no mitigation measures are required, but the following mitigation measure would reduce the adverse effects of the impact.

- **Mitigation Measure 4.18.3.3.1-1:** Any future paleontological discoveries shall be routinely reported to the BLM Authorized Officer for evaluation and possible mitigation.

4.18.3.3.2 Residual Adverse Impacts

There are no residual adverse impacts to paleontological resources.

4.18.3.4 Backfill Alternative

The proposed operations and facilities for the Backfill Alternative would be very similar to the Proposed Action.

4.18.3.4.1 Environmental Consequences and Mitigation Measures

The overall impacts of the Backfill Alternative on paleontological resources would be identical to the Proposed Action and would consist of no significant impacts. The same mitigation measure under the Proposed Action apply to the Backfill Alternative.

4.18.3.4.2 Residual Adverse Impacts

There are no residual adverse impacts to paleontological resources.

4.18.3.5 No Action Alternative

As a result of the No Action Alternative, no additional disturbance, as outlined in the Proposed Action, would occur.

4.18.3.5.1 Environmental Consequences and Mitigation Measures

No impacts would result on paleontological resources from implementation of the No Action Alternative.

4.19 Relationship Between the Local Short-Term Uses of the Human Environment and the Maintenance and Enhancement of Long-Term Productivity

Short-term is defined as the life of the Project through closure and reclamation. Long-term is defined as the future beyond reclamation. Many of the impacts associated with the Proposed Action would be short-term and would cease following successful reclamation. However, decreases in long-term soil and vegetation productivity in reclaimed areas are expected until the areas have fully recovered. Long-term soil and vegetation productivity under all alternatives is expected to be generally similar as under the Proposed Action.

4.20 Irreversible/Irretrievable Commitment of Resources

Construction and operation of the Project could result in either the irreversible or irretrievable commitment of certain resources. Irreversible is a term that describes the loss of future options. It applies primarily to the effects of use of nonrenewable resources, such as minerals or cultural resources, or to those factors, such as soil productivity, that are renewable only over very long periods of time. Irretrievable is a term that applies to the loss of production, harvest, or use of natural resources. For example, livestock forage production from an area is lost while an area is serving as a mining area. The production lost is irretrievable, but the action is not irreversible. If the use changes and the mine is reclaimed, it is possible to resume forage production. Irreversible and irretrievable impacts of the Proposed Action are summarized in Table 4.19.1.

4.21 Energy Requirements and Conservation Potential

Energy for the Proposed Action would be supplied by electricity, propane, and diesel fuel. Electricity would be used to power all equipment in the process plant and ancillary facilities, pump water used in the operation, and provide lighting for mining and processing activities. The electrical load would be approximately 158 megawatts. Propane would be used to heat buildings, and approximately 622,593 gallons per year would be consumed. Diesel fuel would be used to power all mobile equipment and emergency back-up generators. About 30,500,000 pounds per year would be used, following initial start-up and pre-stripping. Life-of-project consumption is presented below:

- Electricity - 1,264 Megawatt-hours
- Propane - 4,980,744 gallons
- Diesel Fuel - 366 million pounds

The only alternative that would have a substantial energy consumption different from the Proposed Action is the No Action Alternative.

Table 4.19.1: Irreversible and Irretrievable Commitment of Resources by the Proposed Action

Resource	Irreversible Impacts	Irretrievable Impacts	Explanation
Geology and Minerals	Yes	Yes	Mineral resources that are mined would no longer be available for future production.
Soils and Watershed	No	No	Soils from the open pit, waste rock dump, and heap leach facilities would be salvaged for use in the reclamation activities.
Water Resources	No	Yes	Water that is removed from the aquifer and used in the operations would not be available for other uses.
Air Resources	No	No	Emissions from the Project would not deteriorate the existing air quality of the air basin.
Range Resources	Yes	Yes	There would be a temporary loss of 352 AUMs throughout the life of the Project and a permanent loss of 36 AUMs.
Noxious Weeds	No	No	Successful reclamation and mitigation measures designed to exclude noxious weeds from the Project Area would result in no impacts.
Vegetation Resources	Yes	Yes	A total of 605 acres of vegetation would be lost as a result of the open pit development.
Wildlife and Fisheries Resources	Yes	Yes	A total of 605 acres of wildlife habitat would be lost as a result of the open pit development.
Visual	No	No	Impacts to visual resources would result from the expansion of the existing operations. Successful reclamation procedures at the end would return the visual continuity.
Auditory Resources	No	No	Noise is not considered irreversible because it would cease when mining operations cease.

(Continued on the next page)

Resource	Irreversible Impacts	Irretrievable Impacts	Explanation
Land Use, Access, and Public Safety	Yes	Yes	There would be irreversible and irretrievable impacts to public access and land use from the commitment of 605 acres to an open pit.
Recreation and Wilderness	No	No	The disturbance as a result of the open pit development would create a minimal loss of recreation area no loss or impacts to wilderness.
Socioeconomic Values	Yes	No	The economic wealth generated from the production and further use of the gold resources underlying the South Pipeline Project would be irreversible. The jobs, income, and taxes created over the life of the Project reflects irreversible resource commitment to achieve such production, but also represents a measure of economic benefits associated with the Project.

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5 CUMULATIVE IMPACTS

5 CUMULATIVE IMPACTS

Cumulative impacts are the sum of all past, present, and reasonably foreseeable future impacts resulting primarily from mining, commercial activities, and public uses. The purpose of the cumulative analysis in the Draft Environmental Impact statement (DEIS) is to evaluate the significance of the contributions by the Proposed Action to cumulative impacts. A cumulative impact is defined under federal regulations as follows:

> "...the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individual minor but collectively significant actions taken place over a period of time" (40 Code of Federal Regulations (CFR) 1508.7).

Therefore, as required under the National Environmental Policy Act (NEPA), this chapter addresses the cumulative effects on the environmental resources in the Cumulative Effects Study Area (CESA) which could result from the implementation of the Proposed Action and other past actions, present actions, and reasonably foreseeable future actions (RFFA).

For the purposes of this analysis, and under federal regulations, 'impacts' and 'effects' have the same meaning and are interchangeable. The cumulative impacts analysis was accomplished in three steps:

- Step 1: Identify, describe and map study areas for each resource evaluated;
- Step 2: Define time frames, scenarios, and acreage estimates for cumulative impact analysis. Past and existing disturbances include commercial/public and mining operations with disturbed areas not reclaimed or unsatisfactorily reclaimed. Future scenarios address reasonably foreseeable commercial/public and mining operations identified in Notices, Plans of Operations, or best judgement based on recent mineral exploration history; and
- Step 3: Identify and quantify the location of possible specific impacts from the Proposed Action and judge the significance of these contributions to the overall impacts.

Information utilized in the cumulative impacts assessment was gathered from a number of sources, including the Bureau of Land Management (BLM), State of Nevada, local jurisdictions, private land owners, and mining companies. The past, present, and future projects are those identified and current as of April 15, 1999. Changes in projects after this date are not considered in this analysis.

5.1 <u>Introduction</u>

The geographical area considered for the analysis of cumulative effects may vary in size and shape to reflect each evaluated environmental resource. For this cumulative impact analysis, Geology and Minerals, Vegetation, Cultural, Ethnography, Wildlife and Fisheries, Soils and Watershed, Visuals, Auditory Resources, Land Use and Public Safety, and Paleontology have a CESA which is generally bounded by the Cortez Mountains to the east; the town of Crescent Valley to the north; the Shoshone Range to the west; and the Toiyabe Range to the south (see Figure 5.1.1). The area is approximately 371,200 acres in size.

The CESA for water resources includes the Project Area, as well as a larger area including the Crescent Valley Hydrographic Basin (No. 54) and is referenced and identified in Section 4.4. The CESA for air resources includes the Project Area, as well as a larger area including the Crescent Valley Air Basin. This is also the area defined as the Crescent Valley Hydrographic Basin (No. 54) and is referenced and identified in Section 4.4.

The CESA for recreation and wilderness resources includes the Project Area, as well as a larger area encompassing portions of Elko, Lander, Eureka Humboldt, and Pershing Counties. The area is included in planing Regions IV, V, and VI, of the Nevada statewide Comprehensive Outdoor Recreation Plan (SCORP). The study area definition was based on the fact that some of the workers in the CGM employees live up to 70 miles from the mine, with over 50 percent living in Carlin and Elko. Due to the fact that developed recreational opportunities are relatively sparse in this part of Nevada , it is assumed that users would travel to some remote areas, especially on

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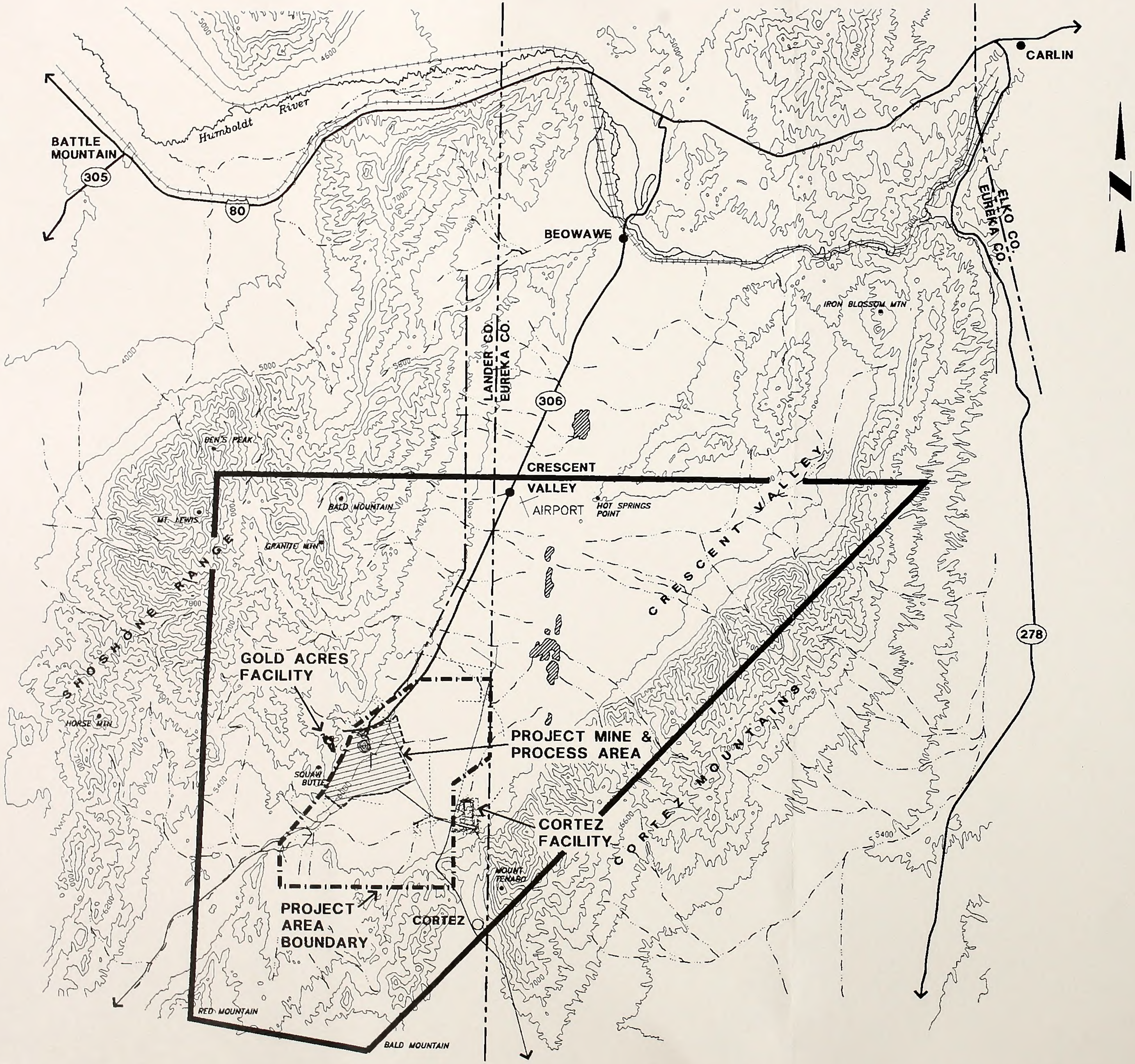

EXPLANATION

- 80 INTERSTATE
- 306 STATE HIGHWAY
- COUNTY BOUNDARY
- RAILROAD
- 5400 TOPOGRAPHY
- INTERMITTENT STREAMS
- POWER LINE
- CUMULATIVE EFFECTS STUDY AREA BOUNDARY

MILES

0 5 10

File: 1298-511-IGG

Date: 5/18/99

Reviewed By: KK & RD

RESOURCES

GEOLOGY AND MINERALS
VEGETATION
CULTURAL
ETHNOGRAPHY
WILDLIFE AND FISHERIES
SOILS AND WATERSHED
VISUALS
AUDITORY
LAND USE AND PUBLIC SAFETY
PALEONTOLOTY

CUMULATIVE EFFECTS STUDY AREA MAP

Figure 5.1.1

weekends to recreate. The CESA boundary for recreation and wilderness will be represented by the General Location Map (Figure 1.1.1), as will the CESA for socioeconomic values and public services which includes Battle Mountain in Lander County, Beowawe and Crescent Valley in Eureka County, and Carlin and Elko in Elko County.

The CESA for range resources is the Carico Allotment. (see Figure 4.6.1). The CESA was selected to consider the resource base that could sustain cumulative impacts due to other projects affecting the same resource.

Environmental consequences of the Proposed Action were evaluated in Chapter 4 for the various environmental resources. Based upon scoping activities conducted for the Proposed Action, and the analysis of the environmental resources conducted in Chapter 4, all resources except for cultural resources, ethnography, and paleontology are considered to have the potential to be cumulatively impacted by existing and proposed developments within the identified CESA for that resource.

Project-specific impacts to the other resources evaluated in Chapter 4 may also occur as a result of the RFFAs, but these impacts would not be cumulatively significant. The potentially significant cumulative effects to these first-identified resources from the past, present, and RFFAs are discussed in Section 5.5.

The individual projects described below comprise the past actions, present actions, and RFFAs identified by the BLM - Battle Mountain and Elko field offices. The projects and uses include mining, commercial activities, and public uses. All of the projects and uses have the potential to impact the environmental resources of concern within the CESA. The RFFA analysis for this EIS was evaluated for a 15-year time frame based on the estimated potential future life of the Proposed Action.

5.2 Past and Present Actions

The past disturbances have been associated primarily with livestock grazing, agricultural development, and mining. The entire CESA has been utilized for livestock grazing. Agricultural development has altered the soils and vegetation. Native plant communities have been altered by grazing, rangeland fires, and the introduction of non-native plants. In addition, small acreages have been disturbed to accommodate water storage facilities and fencing.

5.2.1 Mining and Exploration-Related Actions

Pre-1950 mining disturbances were generally small acreages associated with the mining of vein-type deposits. The exception is Gold Acres, which was one of the first large-scale gold mining operations that used leaching to retrieve the gold from low-grade ore. The more recent mining activities in the 1980s and 1990s have been larger-scale gold and silver mining operations (Figure 5.2.1).

A summary of historic and more recent mining activities has been separated into older and newer operations. The older operations were generally those operating in the 1800s to the 1950s. The newer operations were those operating from the 1950s to present. However, most of the acreage disturbed by mining was disturbed in the late 1970s through the 1980s. Estimated acreages for the disturbances are shown in Table 5.2.1.

5.2.1.1 Cortez Mine

The Cortez Mine is a moderate-sized gold mining operation that began in 1969 and has continued to the present day. The Cortez Mine includes the Horse Canyon mining operation and the haul road from Horse Canyon to the Cortez Mine. There is a current disturbance of 1,294 acres from pits, dumps, roads, a mill, leach pads, and tailings ponds. The expansion approved in 1994 will disturb an additional 428 acres, for a total of 1,722 acres.

CGM is currently conducting ground water remediation at the Cortez Mine under a NDEP-directed plan to remove low concentrations of cyanide from a localized area of shallow ground water. A system of pollution control wells recovers the shallow ground water for use as process makeup water at the Cortez plant. The system does not increase the plant's consumptive use of water because use of recovered water reduces the need for higher quality freshwater as makeup.

5.2.1.2 Pipeline Project/Crescent Pit Projects

The Pipeline and Crescent Pit projects consist of 3,166-acres of existing and/or approved surface disturbance. The projects include the Pipeline open pit, the Crescent open pit, associated dewatering system, waste rock dumps, a combined heap leach/tailings impoundment facility, an 11,000-ton/day ore processing facility, and ongoing exploration drilling. A complete discussion of the Pipeline and Crescent Pit projects is located in Chapter 2.

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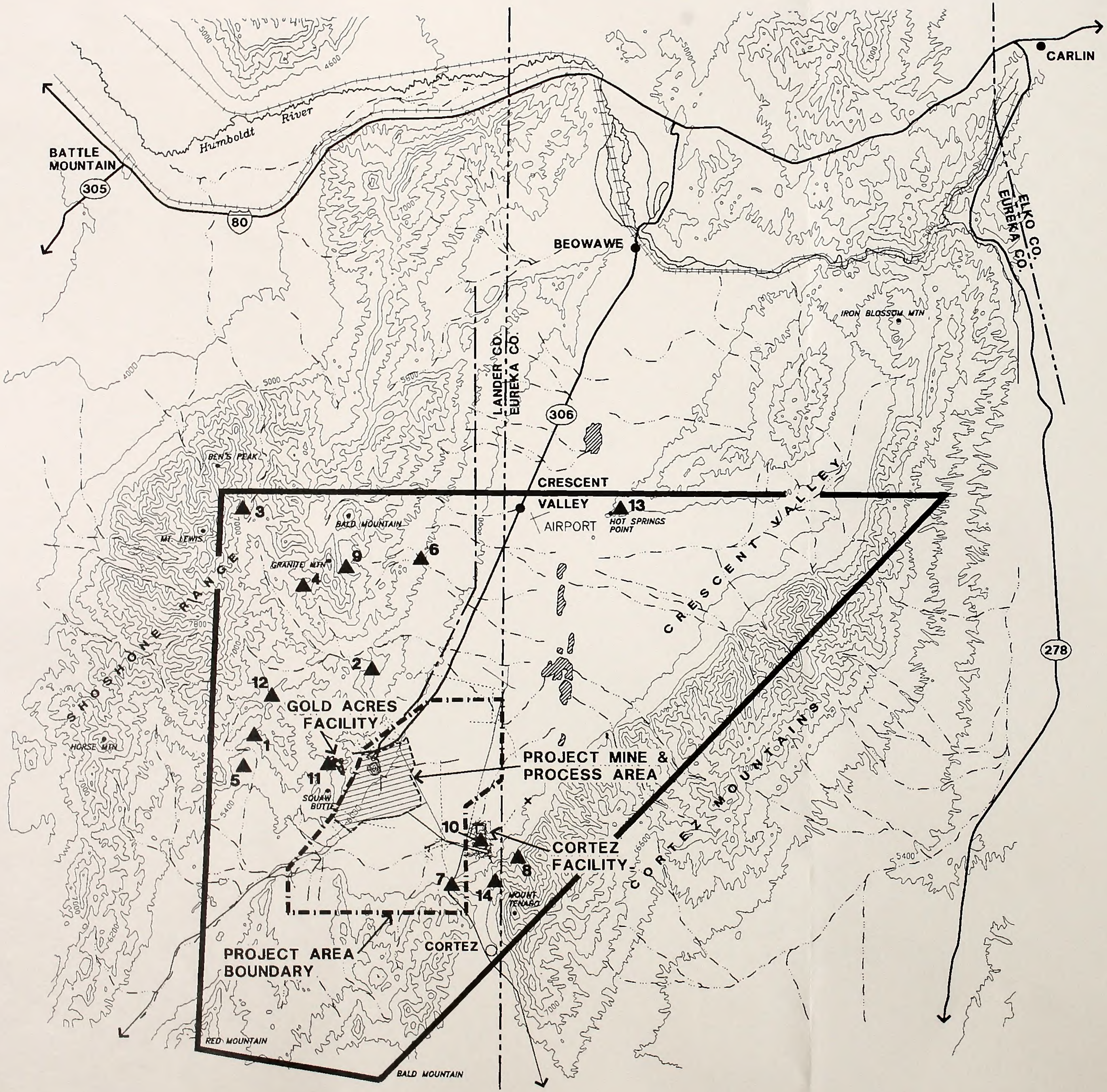


EXPLANATION

1 ELDER CREEK MINE (Gold)
2 ROBERTSON PROJECT (Gold)
3 HILLTOP MINE
4 GREY EAGLE MINES (Gold-Silver)
5 CLIPPER MINE (Barite)
6 UHALDE PLACER MINE
7 FOX MINE
8 MILL CANYON (Gold)
9 MUDSPRING GULCH (Gold)
10 CORTEZ MINE (Gold)
11 GOLD ACRES MINE (Gold)
12 UTAH MINE CAMP (Gold)
13 HOT SPRINGS SULFUR MINE
14 CORTEZ SILVER MINING DISTRICT

MILES 0 5 10

NORTH

File: 1298-521-ICG

Date: 5/18/99

Reviewed By: KK & RD

LOCATION OF THE HISTORIC AND EXISTING MINING PROJECTS WITHIN THE CUMULATIVE EFFECTS STUDY AREA

Figure 5.2.1

Table 5.2.1: Surface Disturbance Associated with Projects within the Cumulative Effects Study Area

Project	Existing/Approved (acres)	Proposed (acres)	RFFA (acres)	Total (acres)
MINING				
Clipper	400	0	0	400
Cortez Mine Area	1,722	0	1,100	2,822
Cortez Silver Mining District	92	0	0	92
Elder Creek	150	0	0	150
Fox Mine	4	0	0	4
Grey Eagle	5	0	0	5
Gold Acres	881	0	50	931
Hilltop	92	0	0	92
Hot Springs Sulfur Mine	5	0	0	5
Mill Canyon	18	0	0	18
Mud Spring Gulch	10	0	0	10
Pipeline Project/Crescent Open Pit	3,166	0	0	3,166
Robertson	285	0	0	285
Satellite Mine	0	0	1,500	1,500
South Pipeline Project	0	4,450	2,000	6,450
Uhalde Placer	100	0	0	100
Utah Mine & Camp	6	0	0	6
Subtotal:	**6,936**	**4,450**	**4,650**	**16,036**
EXPLORATION				
Notices (97) BLM, Battle Mountain Field Office	485	0	0	485
Plans (7) BLM, Battle Mountain Field Office	306	0	0	306
Notices (10) BLM, Elko Field Office	50	0	0	50
Santa Fe Mill Canyon	250	0	0	250
Cortez Gold Mines	788	0	500	1,288
Subtotal:	**1,879**	**0**	**500**	**2,379**
Recreation[a]	0	0	0	0
Livestock[b]	6	4	4,313	4,323
Wildlife	0	0	0	0
Agriculture Development[c]	6,700	875	375	7,950
Crescent Valley Water Supply[d]	2	0	0	2
Subtotal:	**6,708**	**879**	**4,688**	**12,275**
TOTAL:	**15,523**	**5,329**	**9,838**	**30,690**

[a] Surface disturbance associated with recreation activities has occurred; however, the acreages have not been quantified.
[b] Surface disturbance associated with existing and proposed livestock water use is assumed to be 0.5 acres per water right. The surface disturbance associated with the livestock RFFAs is from the seeding activities (change in vegetation and habitat) and 0.5 acres per water development activity.
[c] Surface disturbance associated with agriculture development is based on the acreage under irrigation and assumes that a change in vegetation and habitat equates to surface disturbance. Acreage values obtained from a February 15, 1998 special hydrographic abstract for Hydrographic Basin No. 054 from the NDWR.
[d] Surface disturbance associated with the Crescent Valley water supply is assumed to be one acre per water well.

5.2.1.3 Gold Acres

The older 1930s through 1950s operations disturbed 450 acres through the construction of roads, pits, tailings, and the townsite of Gold Acres. More recent mining has disturbed an additional 431 acres. The old mining townsite of Gold Acres no longer exists due to mining activities on patented lands.

5.2.1.4 Other Mines

The historic Cortez Silver Mining District has disturbed 92 acres. Fifty acres has been disturbed by recent operations including 42 acres for seismic lines, seven acres for roads, and one acre for additional tailings.

The Utah Mine and Camp site, located on the western edge of the CESA, has approximately six acres of disturbance, including the surrounding small sites. The Utah Mine and Camp site is almost completely revegetated. No recent mining disturbance has occurred.

The Mill Canyon site consists of 17 acres of mining disturbance that occurred prior to 1950 and one acre of new disturbance resulting from Notice-level mineral exploration that occurred in 1988. Historic operations also resulted in some ground water contamination.

Mud Spring Gulch encompasses all the adits and small open pits within the Bullion Mountain - Mud Spring Gulch area. There are approximately seven small historic mines and associated open pits which together disturb approximately ten acres.

The Robertson project consists in part of a small, modern-era open pit gold mine, originally operated by Coral Resources, Inc., located approximately 4 miles north of Gold Acres and the Pipeline project operations. Disturbance is estimated at approximately 100 acres. Other portions of the Robertson project include Triplet Gulch, Gold Quartz, and exploration in the Tenabo area. The Triplet Gulch project is an adjacent smaller exploration project. Total disturbance at Triplet Gulch is estimated at 29 acres, all of which has been reclaimed. The Gold Quartz operations associated with this mining site, including a small historic townsite, disturbed a total of six acres. An additional 150 acres of disturbance is associated with more recent mining activity. CGM now controls the Robertson project.

The Grey Eagle project is a small, historic and recent, underground gold mine with a leach operation located in the Shoshone Range with a surface disturbance of approximately 5 acres.

The Elder Creek project is a small gold mine located in the Shoshone Range. The project was permitted in the late 1980s for disturbance totaling 150 acres. The project is currently working on closure of the heap leach pads.

The Uhalde Placer Mine is a dry placer operation located at the base of the Shoshone Range in Crescent Valley. The placer operation is permitted for a total disturbance of 100 acres. The mine also operates a gravel operation for materials excavated from private land.

M.I. Drilling's Clipper Mine, a barite operation located in the CESA west of Gold Acres in the Shoshone Range, is inactive and in closure. The Clipper Mine has disturbed approximately 400 acres.

The Hot Springs Sulfur Mine is an historic open pit mine located near Hot Springs Point east of the town of Crescent Valley and consists of roads, pits, dumps, and trenches. The mine is currently inactive and disturbance at the site totals approximately five acres.

The Fox Mine is an active turquoise mine located in the extreme northern portion of the Toiyabe Range. Operations at the mine have disturbed approximately four acres to date.

5.2.1.5 CGM Exploration

A majority of current CGM exploration-related disturbance has occurred in the Shoshone Range. Disturbance of 788 acres is approved under existing exploration plans of operation.

5.2.1.6 Other Exploration

Small-scale exploration operations creating isolated areas of land disturbance are scattered throughout the CESA. Newmont's Mill Canyon has disturbed 250 acres (Table 5.2.1). Other miscellaneous exploration disturbances include 97 Notices in the BLM Battle Mountain Field Office for 485 acres, seven Plans include 306 acres of disturbance, and 10 Notices in the BLM's Elko Field Office for 50 acres. Exploration disturbance consists primarily of road building and drill pad construction. Table 5.2.1 includes this 1,879 acres of other exploration disturbance within the CESA.

5.2.2 Commercial and Public Use Actions

5.2.2.1 Recreation Actions

Recreational activities are primarily oriented toward the observation and enjoyment of the area's scenery, and natural and historic resources. Activities include off-highway vehicle (OHV) use, hiking, birdwatching, and hunting. Highway 306 and Lander County Road 225 provide access for a variety of recreational activities, including small and big game hunting, OHV touring, and dispersed camping. These activities have not required major improvements for recreational purposes, as existing roads and trails are the primary facilities associated with these activities. Improved facilities, even relatively primitive campgrounds, are rare in the CESA. Surface disturbance has occurred as a result of recreation activities; however, the acreage for this disturbance has not been quantified.

5.2.2.2 Livestock Actions

Existing livestock water use includes 12 water rights. Surface disturbance associated with the livestock water use is assumed to be approximately six acres.

5.2.2.3 Wildlife Actions

BLM wildlife management objectives in the Carico Lake Allotment are specifically defined in the Shoshone-Eureka Rangeland Program Summary (RPS) and the Elko RPS. Within the CESA, a short-term goal is to improve 28,658 acres of big game habitat to good condition and 914 acres to excellent condition. Another short-term goal is to stop the downward trend on 33,228 acres and manage for upward trends on 32,064 acres. An overall objective is to manage rangeland habitats to maintain or enhance sage grouse leks and nesting areas.

NDOW plans to construct big game guzzlers for antelope south of Crescent Valley. Specific locations have not yet been identified, but they will most likely be outside of the CESA (Personal Communication, Rory Lamp, Biologist, Nevada Division of Wildlife, January 19, 1999).

5.2.2.4 Water Supply Actions

Water for the town of Crescent Valley is currently supplied by two wells, a main and backup. Water is stored in two tanks with capacities of 150,000 and 200,000 gallons. Surface disturbance associated with these activities is assumed to be approximately two acres.

5.2.2.5 Agricultural Actions

Existing agriculture development consists of 6,700 acres under irrigation.

All the past and present actions have resulted in approximately 15,523 acres of surface disturbance within the CESA. Water use for the cumulative assessment is discussed in Section 5.5.3.

5.3 Proposed Actions

5.3.1 Mining Related Actions

The Proposed Action represents the only proposed activity within the CESA, as of February 15, 1998. As outlined in Chapter 3, the Proposed Action would result in new surface disturbance totaling 4,450 acres (Table 5.2.1).

5.3.2 Commercial and Public Use Actions

No recreational improvements are proposed within the CESA. Dispersed recreational activities have not required major improvements for recreational purposes (see Section 5.2.2.1).

No new land use plan objectives, other than those previously identified and approved in the Shoshone-Eureka and Elko RPSs, have been proposed in the CESA (see Section 5.2.2.2). Proposed livestock

water use includes eight water rights at a projected total rate of approximately 215 afy. Surface disturbance associated with the livestock water use is assumed to be approximately four acres.

No new wildlife management objectives have been proposed within the CESA other than those previously identified and approved in the Shoshone-Eureka and Elko RPSs (see Section 5.2.2.3).

There are no proposed changes to the town of Crescent Valley's water supply. Proposed agriculture development includes the irrigation of approximately 875 acres.

All of the proposed actions result in approximately 5,329 acres of surface disturbance within the CESA . Water use for the cumulative assessment is discussed in Section 5.5.3.

5.4 Reasonably Foreseeable Future Actions

5.4.1 Mining Related Actions

The Pipeline project Final Environmental Impact statement (FEIS) evaluated mining-related RFFAs (BLM 1996a; pages 5-2 through 5-9), a number of which have been included in this section. There are, however, a few uses enumerated in the Pipeline FEIS which have subsequently been evaluated by CGM and are now not considered to be reasonable. These are the following:

- West Pixie
- Mill Canyon Tailings
- North London Extension

In addition, it is reasonable to expect some changes in consumptive use of water by mining-related activities. The changes are discussed in Section 5.5.3.

5.4.1.1 Cortez Mine Area

Definition of additional mineable gold ore reserves continues in the Cortez open pit area. It is reasonably foreseeable that new reserves would be mined. The mineable ore would most likely be treated at the Cortez continuous fluid bed (CFB) roaster, Carbon-in-Leach (CIL) mill, and tailings facility or heap leach pads. Additional leach pad facilities may be required if leachable reserves are sizeable. Potential mining operations in the area would consist of pushing back existing pits and/or developing new pits adjacent to existing ones. The existing waste rock dumps would likely be expanded both vertically and horizontally with waste from new open pits. The need for dewatering for the Cortez open pit area would be determined once the extent of mineralization was determined. Surface disturbance associated with these activities would occur in areas previously approved for surface disturbance.

CGM has an ongoing exploration program around the Cortez open pit area and in the area of the old Cortez mining district townsite. For the purposes of the RFFAs, a new mine in this area should be included in the analysis. The New Cortez Mine would be located south of the existing Cortez facility. The open pit mine would consist of one or two discrete open pits, with most of the mined ore amenable to heap leaching or processing through the existing Cortez oxide mill circuit. Dewatering of the pit areas prior to mining is expected to be minimal. In addition to the pits, disturbance would consist of several discrete waste rock dumps, mine area haul roads, growth media stockpiles, subgrade ore stockpiles, and a new heap leach/processing facility. Mill-grade ore would be hauled either to the Cortez and/or Pipeline processing facilities on existing haul roads. Disturbance associated with the New Cortez Mine open pit mine area could reasonably consist of 1,000 acres of pits, waste rock dumps, roads, and a heap leach pad and associated processing facility.

The existing Cortez tailings facility, consisting of seven cells, covers approximately 110 acres. The currently approved impoundments have sufficient capacity for approximately four years of production. The additional capacity required for extended operations would be obtained by adding additional cells to the present pond and/or by extending the height of the present dikes . Assuming that an additional cell would be added, up to an additional 100 acres would be disturbed through construction and associated facilities. The cell would be built adjacent to the active facility, the final location to be determined by geotechnical work and land ownership considerations.

5.4.1.2 Gold Acres

The Gold Acres open pit is located mainly on patented claims approximately 1.5 miles from the proposed South Pipeline open pit. CGM plans to develop additional reserves at this site in the future (BLM 1996a; page 2-47). It is assumed that there would be approximately 50 acres of surface disturbance.

5.4.1.3 Pipeline/South Pipeline Project

Based on the mineral exploration and development activities in the Cortez-Pipeline area, it is assumed that activities associated with mineral exploration and mine development would continue. Therefore, the following mineral development activities by CGM are projected as RFFAs:

- Expansion and development of the South Pipeline open pit within the Project Area beyond that proposed in Chapter 3 of this EIS;
- The discovery and development of a satellite ore body; and
- Development of underground mining within the Project Area.

The discovery and development of these RFFAs would result in the development of the following:

- Continuation of dewatering operations at proposed or increased rates;
- Expansion of the Cortez tailings facility;
- Use of refractory ore processing technologies; and
- Sulfide waste rock disposal.

RFFAs may include the development of open pits or additional resources within the existing Project Area. Additional exploration drilling may also determine the presence of an economic gold resource outside of the Project Area.

5.4.1.3.1 Future Mineral Resource Development

The Gap mineral deposit would include the development of a new open pit and waste rock dump area located southwest of the South Pipeline open pit. This shallow (above the water table), deposit would be treated by either mill or heap leach facilities located within the Project Area. Total estimated surface area disturbed would be approximately 500 acres, all of which would be located in the area of Ancillary Facilities identified as part of the Proposed Action.

Significant mining operations are foreseeable to the east of the South Pipeline open pit. These operations would include an expansion of the Pipeline/South Pipeline open pit, additional height on the waste rock dump and tailings expansion, and a continuation of the Pipeline/South Pipeline mine dewatering program. The Deep South mineral deposit could produce ore suitable for conventional CIL or heap leach operations. Mining of the Deep South mineral deposit would require a deepening and/or push back/expansion of the proposed South Pipeline open pit and would disturb up to an additional 1,400 acres. Waste stripping requirements would be high to develop this deposit, and waste rock material removed during mining would be placed in both an expansion of the South Pipeline waste rock dump or backfilled into mined out portions of the Pipeline/South Pipeline pit. Ore could be processed at either the South Pipeline heap leach facility, Pipeline mill facility, Gold Acres heap leach facility, or Cortez mill facility.

Underground mining may be utilized to mine deep, high-grade feeder zones that may be located in the vicinity of the South Pipeline open pit. Underground mining could take place within the existing and proposed portions of the Project Area. Ore mined using underground techniques would be processed using existing and proposed facilities. Waste rock production would be minimal. Surface disturbance associated with these activities would occur in areas previously approved for surface disturbance.

5.4.1.3.2 Satellite Mineralization Development

Intensive gold exploration along mineralized trends associated with the Pipeline/South Pipeline ore deposit would continue into the reasonably foreseeable future. Based on the current geologic understanding of the trend, it is reasonable to expect that at least one additional mineable resource would be delineated. For the purpose of analyzing cumulative impacts, it is assumed that one new deposit, hypothetically called the Satellite Mine, will be defined, approved and mined.

A satellite mine consists of one or more open pits and associated waste rock dumps from which ore is mined and then transported for processing to a previously approved existing process facility. This hypothetical Satellite Mine is assumed to be located approximately 1.5 miles north-northwest of the Pipeline mill facility at an elevation of approximately 5,500 feet. The ore would be hauled to the Pipeline mill or to the South Pipeline heap leach pad and processing facilities. New heap leach pads and a processing facility could be constructed nearby the mine area to reduce hauling costs. The roads would be designed for the existing mining fleet. The waste rock would be hauled to waste rock dumps located south and southwest of the satellite mine open pit. The waste rock, as with the ore, is oxidized and would therefore not be a potential source

of acid rock drainage (ARD). The waste rock dumps would be constructed in a manner so that they could be reshaped and reclaimed to blend with the present topography.

Total additional disturbance associated with the assumed Satellite Mine would be approximately 1,500 acres. It would consist of one open pit, haul roads, two waste rock dumps, and a possible new heap leach facility. Existing ancillary facilities such as the explosives magazine, truck shops, offices, et cetera located at the South Pipeline Project Area would be utilized for these mining operations.

The anticipated life of the Satellite Mine Project would be six years, and this project would be mined concurrently with and following the South Pipeline open pit. The Satellite Mine would add approximately three additional years of operation to the Pipeline mill and leach pad facilities. Reclamation of the Satellite Mine components would be partially completed during mining, but final reclamation would take a minimum of three years after completion of the open pit.

5.4.1.3.3 Reasonably Foreseeable Future Dewatering Operations

It is reasonably foreseeable that dewatering of the South Pipeline open pit would continue in the event that mining activities continue beyond those described in the Proposed Action. Dewatering rates would be expected to remain approximately the same as that for the South Pipeline Project or increase slightly and require the construction of additional infiltration facilities and associated water conveyance corridors, access roads, and excavation stockpiles located within and outside of the Project Area, resulting in the disturbance of approximately 600 additional acres. Infiltration site locations would be located to maximize infiltration capabilities and minimize impacts from dewatering. The acreage is in addition to the acreage discussed in Chapter 2. The additional sites would be located to work in conjunction with the basins constructed as part of the approved Pipeline Infiltration project, as well as any infiltration sites associated with the South Pipeline Project. The additional infiltration basins would have a similar design as the basins outlined in Section 2.3.2.1 and illustrated in Figure 2.3.1.

Use of dewatering water on the Dean Ranch may be increased in future years. The use would be subject to substitution of existing water rights assigned to the ranch, and approval by the State Water Engineer.

5.4.1.3.4 Refractory Ore Processing

New processing techniques could be developed that would enhance the recovery of gold from refractory ore. The presence of carbon and sulfide minerals in non-oxide ore can significantly reduce the effectiveness of cyanide leaching. Sulfides react with and consume cyanide and natural carbon absorbs the gold from the cyanide solution. Developing ore-processing technology would allow the economic recovery of gold from both sulfide and sulfidic-carbonaceous ores. These methods involve oxidizing the sulfide and carbonaceous material in the ore prior to conventional cyanide extraction. Oxidation is accomplished by heating ground ore in an oxygen-rich environment (roasting), or as a slurry in a high temperature and pressure environment (autoclaving).

The existing Pipeline mill could be expanded or modified to include a refractory ore processing circuit that would consist of a separate crushing system, dry grind/roaster, autoclave, and/or floatation plant.

Future ore processing technologies could include, but are not limited to, the following:

<u>Bio-Leach Technology</u>

A category of low-grade refractory ore would be mined from the South Pipeline open pit. Technology in Bio-leaching of refractory ore is a technology currently being developed by the mining industry and is a process where ore placed on a heap leach pad is treated by introducing bacteria in solution that will break down the sulfide mineralization, thus freeing a portion of the gold associated with the sulfides. The material is then leached using the standard heap leaching process. These activities would occur in areas of existing and proposed activities.

<u>Refractory Ore Processing by Autoclaving, Roasting, or Flotation</u>

The existing Cortez CIL mill dry grinding circuit and CFB roaster may be utilized to treat refractory mill ore that may be mined from the existing, proposed, and/or RFFAs. Enlargement and/or modification of the existing Cortez Mill may be required to effectively process the refractory mill ore because of metallurgical and/or environmental requirements. These activities would occur in areas of existing activities.

In the event that sufficient refractory ore is mined from the Pipeline and/or South Pipeline open pits to warrant

utilizing the Cortez CIL mill dry grinding circuit and CFB roaster, a known reserve currently defined in the Gold Acres open pit would be mined and processed. Between one and two years of roaster feed is defined in the existing open pit area, depending upon the economics at the time of potential mining.

Exploration activities within the Project Area could discover and define economic refractory mill-grade ore in sufficient quantities to warrant the construction of a refractory ore processing mill circuit at the Pipeline milling facility. The additional circuit could include a modification to the existing stockpile handling and crushing system, dry or wet grinding circuit, and a new CFB roaster or autoclave. Upgrading of sulfide-bearing gold ore could be performed in a flotation circuit. Once pre-treatment has been completed on the refractory ore, the ground ore-slurry would be processed in the existing Pipeline CIL circuit. These activities would occur in areas of existing and proposed activities.

Sulfitic Waste Rock Disposal

The capacity of the Pipeline/South Pipeline waste rock dumps may be increased/expanded if future expected mining operations are to focus on additional high-grade unoxidized sulfide reserves.

The capacity of the waste rock dumps to accommodate unoxidized material could be increased by constructing dump facilities in areas already analyzed for impacts, increasing the height of the existing or proposed storage areas, or increasing the area of approved disturbance.

5.4.1.4 CGM Exploration

Exploration activity would continue within the CESA. Work would consist of geologic mapping, sampling and geophysics, followed by the construction of access roads and drill pads, and drilling. Anticipated disturbance for the three distinct mountain ranges within the Joint Venture Area (JVA) is outlined below:

- Exploration disturbance in the Cortez Range may add up to an additional 150 acres over the next 10 to 15 years. The focus of activity would be in the Horse Canyon, Cortez trend, and Buckhorn areas;
- Up to 100 acres of disturbance could be required in the Toiyabe Range over the next 10 to 15 years;
- Up to 100 acres of disturbance in the Shoshone Range could be required over the next 10 to 15 years; and
- Exploration work, totaling approximately 150 acres, could also be conducted in the valley areas adjacent to the mountain ranges within the CESA.

5.4.2 Commercial and Public Access

5.4.2.1 Recreation Actions

Recreational use within the cumulative effects area of the Project is expected to continue to be limited, with dispersed outdoor recreational activities being the predominant type of recreation. No recreational improvements have been identified for the reasonable foreseeable future within the CESA.

5.4.2.2 Livestock Actions

As outlined in the Shoshone-Eureka and Elko RPSs, the activities described below would occur under the RFFA scenario. The long-term goal is to increase licensed grazing use to 30,892 AUM, a 13.7 percent increase. If 70 percent of this goal is completed during the 15-year cumulative assessment period, then the licensed grazing use would be increased by 2,605 AUM. However, the Carico Lake Allotment is currently under evaluation and these figures may not accurately reflect the final goals of the evaluation. The following range improvements are identified in the RPS:

- 12 spring developments;
- 4 water wells;
- 4 water reservoirs;
- 20 miles of water pipeline;
- 86 miles of fence;
- 8 cattle guards; and
- 4,250 acres of seeding.

The long-term vegetation and ecological condition and trend objectives for the allotment include the following:

- Improve 99,038 acres to good condition and 3,158 acres to excellent condition; and
- Stop the downward trend of 114,826 acres and manage for upward trend on 110,808 acres.

Utilization objectives for the allotment area are as follows:

- To not exceed 50 percent on key species by seed dissemination and 60 percent by the end of the grazing year; and
- Utilization of key browse species will not exceed 50 percent in terrestrial big game habitat.

For the purpose of this cumulative analysis, the following assumptions will be made based on the RPS for grazing and current trends for reasonably foreseeable future grazing scenarios. The assumptions are provided such that future management actions that may contribute to cumulative impacts may be analyzed.

- Cumulative assessment period of 15 years;
- Long-term goals stated in the RPS are 20-year goals;
- BLM intends to implement proposed projects/improvements;
- Since the RPS was approved in 1987, 70 percent of the proposed management improvements will have been completed during the 15-year cumulative assessment period; and
- Future funding and staffing considerations as well as the number 22 priority rating of the Carico Lake Allotment will affect feasibility of completion of 70 percent of the proposed livestock management projects/improvements within the specified time.

Based on the above outlined activities, it is assumed that surface disturbance, including the seeding activities, would result in approximately 4,313 acres.

5.4.2.3 Wildlife Actions

No new wildlife management objectives have been identified for the reasonably foreseeable future within the CESA. Wildlife management objectives for the Carico Lake Allotment are specifically defined in the Shoshone-Eureka and Elko RPSs.

5.4.2.4 Water Supply Actions

Future water needs for the town of Crescent Valley include additional storage for fire protection. A new 200,000 gallon storage tank is planned to be added in 1999. It is not expected that the town would request additional water rights during the 15-year RFFA period.

5.4.2.5 Agricultural Actions

It is reasonable to expect that additional water from the dewatering operations would be conveyed by means of a gravity-feed ditch/canal system to areas within the Crescent Valley and used for agricultural irrigation. Disturbance associated with this activity would total approximately 375 acres. Approval by the state Engineer's office would be required for this activity.

All the RFFAs result in approximately 9,838 acres of surface disturbance within the CESA. All past and present actions, proposed actions, and RFFAs result in approximately 30,690 acres of surface disturbance within the CESA. Water use for the cumulative assessment is discussed in Section 5.5.3.

5.5 Evaluation of Potential Cumulative Impacts and Mitigation

The CESA affected environment for each resource is essentially identical to that described in the resource sections of Chapter 4, unless otherwise noted below.

5.5.1 Geology and Minerals

5.5.1.1 Significance Criteria

Environmental impacts to geology and minerals would be significant if an action resulted in any of the following:

- Impacts to the facility site or design caused by geologic hazards, including landslides, slope failures, and ground subsidence;
- Structural damage or failure of a facility caused by seismic loading from earthquakes; or
- Restriction of future extraction of known mineral resources.

5.5.1.2 Environmental Consequences and Mitigation Measures

Surface mining activity affects geology and mineral resources by excavating, modifying, or covering natural topographic and geomorphic features and by removing mineral deposits. Historically, this area has been mined for gold, silver, barite, turquoise, copper, lead, and arsenic.

Mining disturbance has included open pit and underground mining, waste rock disposal, heap leach ore milling and processing, tailings disposal, and exploration (drilling, trenching, sampling, and road construction). The current approved area of disturbance is 8,815 acres, an additional 4,450 acres of disturbance is proposed, and approximately 5,150 acres of disturbance is foreseen under the RFFAs.

Under the Proposed Action approximately 450 million tons of waste rock would be excavated and permanently placed in dumps, tailings facilities, or used, in part, as pit backfill material. An estimated 150 million tons of ore would be removed, processed, and the spent ore left in heap leach pads or tailings facilities.

Mining is a major activity in the area and it is likely that exploration activities and mining would continue. The long-term impact would be the creation of additional or expansion of existing open pits, waste rock dumps, heap leach pads, and tailings facilities in the foreseeable future. The direct impacts affecting the geology and mineral resources of the Project Area due to open pit mining are the permanent removal and loss of resources for future generations. Under the Proposed Action, these direct impacts to geology and mineral would not be significant and would not be mitigated. In addition, no significant cumulative impacts are anticipated.

5.5.2 Soils and Watershed

5.5.2.1 Significance Criteria

The criteria used to evaluate the significance of potential impacts to soils are those criteria identified in the Pipeline project FEIS (BLM 1996a; page 4-13). An action would normally have a significant effect on the environment if the following would occur:

- Cause erosion of disturbed or reclaimed sites that would overwhelm sediment control structures, block natural drainages leading to perennial waters; or
- Could not support revegetation; or
- Cause a loss of soil material during stockpiling or reclamation that would in turn limit reclamation success.

5.5.2.2 Environmental Consequences and Mitigation Measures

Current and historic mining operations within the study area have resulted in disturbance to approximately 8,815 acres of soils. An additional 4,450 acres of disturbance would result from the Proposed Action. Of this acreage, 605 acres would remain disturbed as an open pit. Reasonably foreseeable future mining operations would result in an additional 5,150 acres of soil disturbance, for a total of 18,415 acres or five percent of the cumulative assessment area. With the exception of any open pits, this disturbance would be required to be reclaimed. Erosion would result in the loss of additional soil material over the time frame of the reasonably foreseeable future.

Total historic, existing and approved, proposed and reasonably foreseeable future disturbance from mining activities within the study area is 18,415 acres. Of this disturbance, 652 acres are historic disturbance and not subject to current reclamation regulations (BLM 1996a page 5-15). Approximately 3,490 acres (including open pits and historic mining disturbance) would remain as long-term disturbances. Livestock grazing has had and would continue to have, direct and indirect impacts on soils. Grazing impacts to soils are not quantified. The expected disturbance to soils due to range improvements is 4,323 acres (BLM 1996a).

The entire cumulative effects study area includes approximately 371,200 acres; the 3,490 acres of long term disturbance, including the long-term disturbance of the Proposed Action, represents less than one percent of the study area and is not considered significant.

5.5.3 Water Resources

5.5.3.1 Significance Criteria

Criteria for assessing the significance of potential impacts to the quality and quantity of water resources in the study area are described in the following four sections. Impacts to water resources are considered to be significant if these criteria are predicted to occur as a result of an action.

5.5.3.1.1 Surface Water Quantity

- Modification or sedimentation of natural drainages resulting in increased area or incidence of flooding.

- Reduction in flow of springs, seeps, or streams. Predicted impacts are considered to be significant where the modeled 10-foot ground water drawdown contour encompasses a spring, seep, or stream and where the surface water feature is hydraulically connected to the aquifer affected by drawdown.

- Diversion and/or consumptive use of surface water that adversely affects other water rights holders. This criterion includes flows to springs, seeps, or streams where existing beneficial water uses are affected.

5.5.3.1.2 Ground Water Quantity

- Lowering of the water table that results in impacts to other ground water users. The threshold for identifying significant impacts to wells is the modeled 10-foot drawdown contour. Therefore, for the purposes of this study, significant impacts are indicated where the 10-foot contour encompasses an existing well with an active water right and the well is hydraulically connected to the aquifer affected by drawdown.

- A long-term consumptive use of water resources that does not provide water for a beneficial use.

5.5.3.1.3 Surface Water Quality

- Release of mining-related contaminants such as cyanide, or metals such as arsenic and lead, into drainages by spills or flooding that results in soil/sediment contamination in excess of NDEP guidance levels (10 times any applicable maximum contaminant level (MCL) as measured in a meteoric water mobility test (MWMP), or release of fuels and lubricants into drainages resulting in soil contamination exceeding the NDEP guidance level (100 mg/kg of total petroleum hydrocarbons (TPH)).

- A discharge or change in water quality that results in an exceedance of the applicable NDEP standards (Table 4.4.11) for municipal or domestic supplies, aquatic life, irrigation, livestock, or other applicable standards to protect existing or potential beneficial uses in perennial streams, springs, seeps, and the post-mining pit lake.

5.5.3.1.4 Ground Water Quality

- Degradation of natural ground water quality by chemicals such that concentrations exceed NDEP MCLs for drinking water, or render water unsuitable for other existing or potential beneficial uses. For ground water that does not meet MCLs for baseline conditions, degradation will be considered significant where a change in water quality would render the water unsuitable for an existing or potential beneficial use. This criterion is based on NAC 445A.424.

- Degradation of natural soil chemistry by cyanide, trace metals, or other compounds such that concentrations exceed NDEP guidance levels. NDEP guidance levels for soils are based on results of meteoric water mobility testing that are ten times the drinking water standard for each compound. This guidance is designed to protect ground water from contamination by leachate from overlying soils.

5.5.3.2 Environmental Consequences and Mitigation Measures

Cumulative impacts to water resources within the study area are considered from surface water, ground water, and water quality perspectives.

5.5.3.2.1 Surface Water

Cumulative impacts to the perennial streams of Crescent Valley would not be anticipated because none of the perennial drainages are located within the area that is hydrologically affected by the Proposed Action. Potential erosion and sedimentation impacts to ephemeral drainages would increase somewhat if the RFFA projects were implemented sequentially to the Proposed Action. Ephemeral drainages may need to be rerouted around a larger facility, making the courses longer and increasing the potential for erosion and sedimentation impacts. If the expansion of the Pipeline/South Pipeline open pit is implemented, the resulting pit lake that would eventually form after mining ceases could be either larger or smaller than the size of the lake for the Proposed Action. Long-term evaporation losses from the cumulative pit lake may either increase or decrease, depending upon the resulting pit configuration and backfill placement, compared to the Proposed Action's long-term consumptive use of up to 1,246 acre-feet annually. This is potentially a significant impact. In addition, mining-related RFFAs anticipate additional dewatering and

therefore the potential of future pit lakes. This would result in additional consumptive use of water through evaporation for a non-beneficial use. This is also a potentially significant cumulative impact.

5.5.3.2.2 Ground Water

Cumulative impacts related to continuation of mine dewatering are considered as RFFAs for the South Pipeline expansion or development of underground mining. Other reasonably foreseeable mining projects within the Crescent Valley Hydrographic Basin would not involve dewatering, but may contribute to consumption of water resources by withdrawal of ground water for mine uses during operations.

The expansion of the South Pipeline open pit or underground mining would involve continued dewatering at a similar or slightly greater pumping rate than predicted for the Proposed Action. The impacts of continued dewatering pumping would result in a cone of drawdown in the water table that would generally correspond to the model results of impacts for the Proposed Action at the end of mining (Section 4.4.3.3.1) since the extent of drawdown would be limited by the surrounding infiltration sites. The drawdown would probably expand during the years after the end of dewatering as the expanded pit lake fills, eventually encompassing a larger area and potentially affecting additional wells, springs, and water rights within the 10-foot drawdown contour than predicted for the Proposed Action.

The contribution to cumulative ground water impacts from the Proposed Action is significant, as described in Section 4.4.3.3.1 for the Proposed Action alone, and therefore, the cumulative impacts are also significant. The mitigation of potential cumulative impacts could involve the same measures as discussed for the Proposed Action.

Decreased ground water contribution to baseflow of the Humboldt River could result from increased consumptive use of water within the Crescent Valley basin. Increased water uses for agriculture, livestock, municipal, domestic, and mining uses are possible as RFFAs. Since Crescent Valley is a semi-closed basin that does not contribute significantly to the flow of the Humboldt River, the cumulative impacts would be less than significant.

5.5.3.2.3 Water Quality

Process facilities of the Proposed Action, including heap leach and tailings facilities, would be designed and constructed as zero-discharge units in accordance with NDEP regulations. As such, their contribution to cumulative ground water quality degradation is considered to be low. For reasonably foreseeable mining projects, similar facilities using similar chemicals would be constructed and operated. If the facilities were also designed and constructed as zero-discharge units, they would have a similarly low potential for degrading ground water quality.

Construction and operation of the Proposed Action's waste and ore processing facilities have a low potential to impact water quality due to the arid site environment, the depth (250 feet) to the water table, the lack of perennial surface drainage on site, and the zero discharge design of the facilities. Ore stockpiles, waste rock piles, leach pads, tailings, and rock exposed in pit walls for the Proposed Action contain low sulfide high neutralization potential rock types that are not likely to contribute to acid rock drainage. Existing wastes associated with past activities in the Cortez open pit, Crescent open pit, and Gold Acres areas, some of which are presently in the South Pipeline Project (Project) Area, are similarly categorized as low potential to generate ARD. These past, present and proposed mining activities would not significantly contribute to any cumulative ARD impacts. Some of the identified RFFA possible mining projects could involve sulfide ores with a greater potential for ARD that may require particular waste handling procedures or containment designs to be developed for the future plans of operations.

As mentioned in Section 4.4.3.3.1, the post-mining South Pipeline pit lake water quality is initially good, but would eventually exceed baseline concentrations and the Nevada water quality standards due to evapoconcentration. While it was concluded that present beneficial uses would not be degraded by pit lake seepage, there would be some potential for degradation to future beneficial uses. In addition, there would be some potential for pit waters to eventually migrate into the adjacent aquifers. The areal extent of such seepage migration is uncertain, but is expected to be quite localized since the pit lake is predicted to act as a ground water sink for most of the year and would take hundreds of years to completely fill before any outward migration would occur. Future corrective actions using the best available technology would be used to mitigate or remediate any potentially significant

impacts caused by the formation and seepage of evapoconcentrated pit lake waters.

The long-term impacts of evapoconcentration in the pit lake and mobilization of salts from soil zones beneath infiltration ponds would contribute to cumulative water quality impacts in Crescent Valley by altering the basin's salt balance. Virtually any development and beneficial use of water in a semi-closed basin in an arid climate is likely to contribute to the increasing concentration of dissolved solids in the ground water of the basin. In the case of Crescent Valley, the Proposed Action and each of the RFFA's that use water for irrigation, livestock, municipal, domestic, and mining uses would have a marginal contribution to the cumulative long-term increase of TDS in the basin's ground water. This increase of dissolved solids in the basin would take centuries to develop and there are no existing water rights or uses that can be identified as particularly affected. The long-term increases in TDS are considered potentially significant to future beneficial water uses, there are no mitigation measures that appear to be feasible.

5.5.4 Air Resources

5.5.4.1 Significance Criteria

An action would have a significant effect on the environment if any of the following would occur:

- Violate any regulatory requirement of the BAQ;
- Violate any state or federal ambient air quality standard;
- Contribute substantially to an existing or projected air quality violation; or
- Expose sensitive receptors to substantial pollutant concentrations.

5.5.4.2 Environmental Consequences and Mitigation Measures

The identified individual projects within the CESA, including existing and proposed mining operations, each emit criteria air pollutants. With the possible exception of the motor vehicle emissions, which are not evaluated in this document, the existing and proposed mining operations are the major sources of criteria air pollutants. Since the monitored levels of these pollutants within the CESA are below the applicable established SAAQS and NAAQSs, no significant impacts to air resources exist within the CESA. The air quality modeling for the Proposed Action shows the levels of these pollutants below the applicable standards. The Proposed Action would not result in a significant cumulative impact to the air resources. The mining-related RFFAs would result in additional emissions similar to those currently emitted by the existing operations. However, these activities would operate under permit conditions established by the Nevada Bureau of Air Quality (BAQ), and therefore, would likely also not be significant.

5.5.5 Range Resources

5.5.5.1 Significance Criteria

Impacts to range resources would be considered significant if an action could result in any of the following:

- Result in loss of forage and water which adversely affect livestock operations; or
- Create undue harassment which adversely affect livestock operations.

5.5.5.2 Environmental Consequences and Mitigation Measures

Within the Carico Lake allotment, existing and approved and historic mining operations would disturb approximately 8,585 acres or one and one half percent of the allotment and remove 505 animal unit months (AUMs) from use, assuming 17 acres per AUM. Assuming that approximately 7,210 acres of land disturbed by these actions would be successfully reclaimed, the permanent disturbance would be reduced to 1,375 acres or 81 AUMs, less than one percent of the current Active Grazing Preference. A total of 424 AUMs (505 less 81) would be temporarily lost during mine operation which would reduce the current Active Grazing Preference within the Carico Lake grazing allotment to 33,508 AUMs; the current Active Grazing Preference is 33,860 AUMs for the entire allotment. The temporary loss of 424 AUMs within the grazing allotment represents approximately one percent of the current Active Grazing Preference.

Disturbance from reasonably foreseeable future actions is projected to be approximately 5,150 acres or less than one percent of the Carico Lake allotment. Approximately 303 AUMs would be lost by reasonably foreseeable future disturbance within the planning period until the disturbance was reclaimed.

Approximately 59 AUMs would be permanently lost due to potential development described under reasonably foreseeable future actions (Section 5.2, 5.3, 5.4).

A combined total of 18,185 acres of surface disturbance would result from past actions, present actions, proposed mining activities, and other reasonably foreseeable future actions in the cumulative assessment area (Table 5.2.1) (not all disturbance in Table 5.2.1 occurs within the Range Resources CESA). Approximately 15,810 of the 18,185 acres of the total disturbance area would be reclaimed and available for livestock grazing after the completion of reclamation activities. Approximately 930 AUMs would be temporarily lost which is approximately three percent of the current Active Grazing Preference. A total of 140 AUMs would be permanently lost which is less than one percent of the current Active Grazing Preference.

5.5.6 Noxious Weeds

5.5.6.1 Significance Criteria

Based upon BLM Manual 9015 guidelines, a project would be considered to have a significant effect on noxious weed management if it resulted in the following:

- An increased likelihood of noxious weed species being introduced into a relatively weed-free area at moderate or high-ecological risk; or
- An expansion of noxious weed infestation(s) within and outside of the Project Area into relatively weed-free areas at moderate or high-ecological risk.

'Ecological risk' is the level of likelihood and consequence of adverse effects on the environment. A determination of a Risk Rating ('none', 'low', 'moderate', or 'high') is made through the Risk Assessment process outlined in Appendix 1 of BLM Manual 9015. Areas with a moderate or high risk rating have the following characteristics: (a) noxious weed infestations immediately adjacent to or within the Project Area; (b) activities associated with the Project that are likely to result in some areas becoming infested; and (c) there are probable adverse effects on native plant communities within, and possibly outside of, the Project Area.

5.5.6.2 Environmental Consequences and Mitigation Measures

Surface disturbance creates an environment conducive to supporting weed species. Construction and operation of the Proposed Action would result in the disturbance of approximately 4,450 acres of vegetation, or 15 percent of the total surface disturbance resulting from past and present actions, proposed actions, and RFFAs. With respect to mining-related disturbance alone, the Proposed Action constitutes 28 percent. The Proposed Action would disturb approximately one percent of the CESA.

An analogy for the spread of noxious weed infestations is the spread of wildfire. An infestation that starts in one project area may expand to areas outside and increase the chance of the introduction of weeds to other sites of disturbance. The mitigation measures identified to reduce the potential impacts of the Proposed Action would control noxious weed establishment and spread within and adjacent to the Project Area. Therefore, the cumulative and incremental effect of surface disturbance on noxious weed management would be below the level of significance.

5.5.7 Vegetation Resources

5.5.7.1 Significance Criteria

Based upon NEPA guidelines and commonly accepted criteria, a project would normally be considered to have a significant effect on vegetation resources if it resulted the following:

- Substantially affect a species or habitat afforded protection under either the ESA or state law; or designated as having special status (Species of Concern, Sensitive Species, etc.) by an overseeing agency; or
- Eliminate a natural plant community from the Project Area.

Violation of the Executive Order 11990 - Protection of Wetlands would also be considered a significant impact. Effects that are inconsistent with the objectives set forth in the BLM Riparian Initiative are also considered significant.

The degree of significance of the effect is directly related to the dependence of individuals of a plant species on the habitats present within the proposed area

of operations, and how these habitats are altered by the construction and operation of the project. "Dependence" on habitat is evaluated by determining the amount of habitat affected, and what proportion it is of the amount of habitat available within the Project Area.

5.5.7.2 Environmental Consequences and Mitigation Measures

Figure 5.5.1 shows the vegetation communities within the CESA. Construction and operation of the Proposed Action would result in the disturbance of approximately 4,450 acres of vegetation, or 15 percent of the total surface disturbance resulting from past and present actions, proposed actions, and RFFAs. With respect to mining-related disturbance alone, the Proposed Action constitutes 28 percent. The Proposed Action would disturb approximately one percent of the CESA. The amount of area that would not be reclaimed (605 acres) as part of the Proposed Action represents less than one percent of the total surface disturbance resulting from past, present, and RFFAs, and four percent of mining-related disturbance. The vegetation communities within the CESA are similar to those within the Project Area and common in the region. The cumulative and incremental effect of vegetation removal or modification would be below the level of significance.

As discussed in Section 4.8.3.3.1, the water table drawdown resulting from the mine dewatering system is not expected to have a significant effect on surface vegetation within the CESA. Mitigation may be required for the effects of drawdown on three to five springs located to the southwest and east of the Project Area.

The two Special Status Species with potential habitat within the Project Area (Eastwood's milkweed and Elko rockcress), also have additional potential habitat within the CESA. Neither species has a documented occurrence within the CESA. The cumulative effect and incremental loss of potential habitat for the two plant species resulting from past and present actions, proposed actions, and RFFAs would be below the level of significance.

5.5.8 Wildlife and Fisheries Resources

5.5.8.1 Significance Criteria

Based upon NEPA guidelines and commonly accepted criteria, a project would normally be considered to have a significant effect on wildlife resources if the following results occurred:

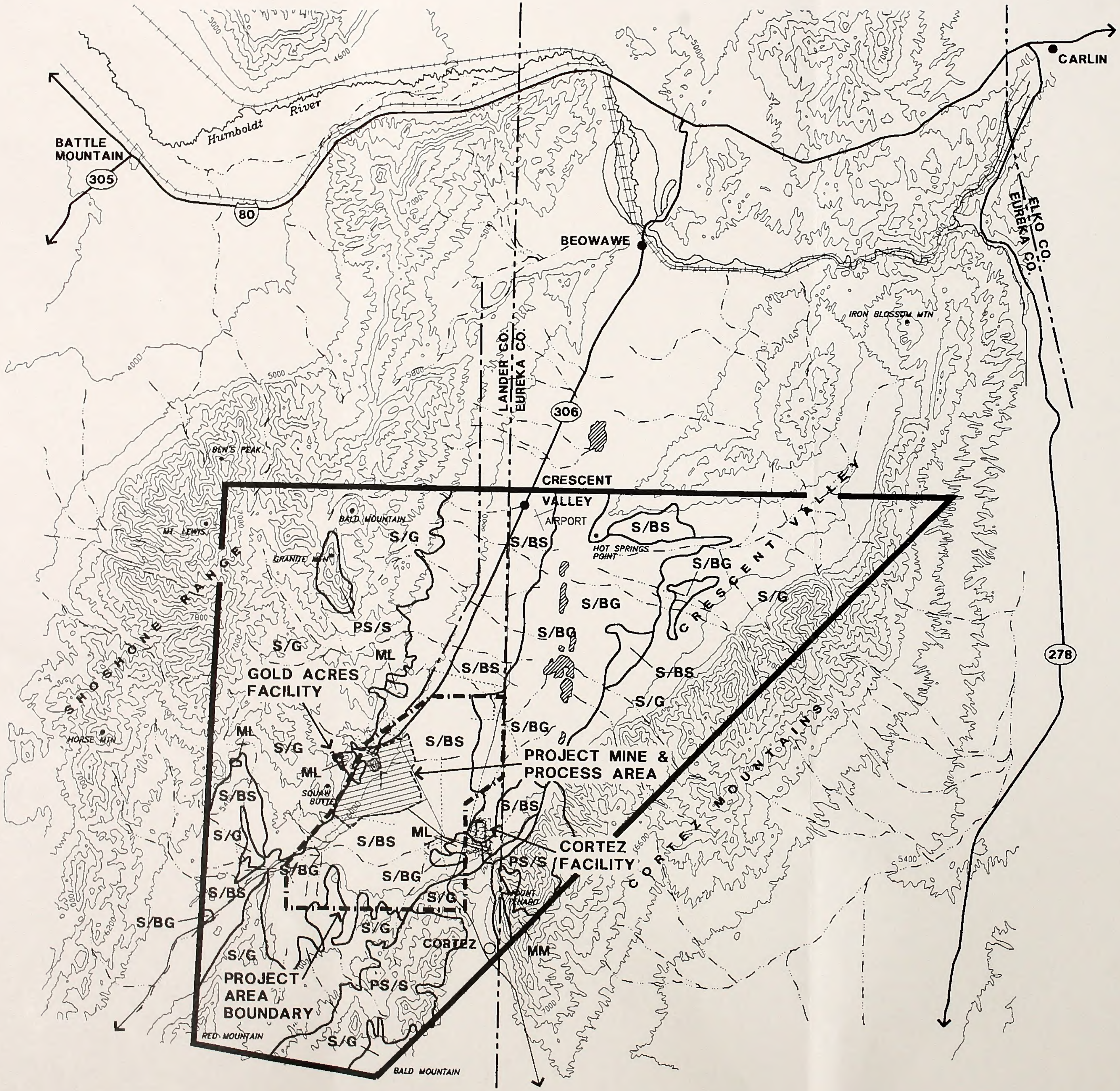
- Substantial disturbance to critical wildlife habitat;
- Loss of a species or habitat afforded protection under either the ESA or state law; or designated as having special status (e.g., Species of Concern, Sensitive Species, etc.) by an overseeing agency;
- Loss of birds protected by the Migratory Bird Treaty Act;
- Elimination of a natural plant community from the Project Area;
- Acute or chronic toxicity resulting from exposure to toxic materials in the pit lake or the tailings heap leach facilities; or
- Destruction of active bat roosts or maternity sites.

5.5.8.2 Environmental Consequences and Mitigation Measures

Cumulative impacts to wildlife and fisheries resources within the Project Area and CESA are considered from a habitat and population perspective. Cumulative impacts to the wildlife and fisheries habitat of Crescent Valley would not be anticipated because the vast majority of land would be reclaimed and none of the perennial drainages would be hydrologically affected by any of the alternatives. Wildlife and aquatic habitat in the Humboldt River drainage would not have significant cumulative adverse impacts because the change in ground water inflow to the Humboldt River drainage would be insignificant.

The cumulative impact of pit lake filling and associated changes in water chemistry is considered a RFFA for the Proposed Action. The long-term impacts of evapoconcentrations of metals in the pit lake would contribute to the risk of potential wildlife mortalities. The type of wildlife impacted would be insectivorous birds and bats.

Expansion of the South Pipeline open pit or underground mining would involve continued dewatering that would affect wildlife and aquatic resources beyond the level predicted for the Proposed Action and other alternatives considered in this document. Vegetation associated with springs would decrease as the cone of depression increased, therein reducing available water to animals.



EXPLANATION

80	INTERSTATE
306	STATE HIGHWAY
	COUNTY BOUNDARY
	RAILROAD
5400	TOPOGRAPHY
	INTERMITTENT STREAMS
	POWER LINE
	CUMULATIVE EFFECTS STUDY AREA BOUNDARY
S/BG	SHADSCALE/BLACK GREASEWOOD
S/BS	SHADSCALE/BUDSAGE
S/G	SAGEBRUSH/GRASS
PS/S	PIÑON-JUNIPER/SAGEBRUSH
MM	MOUNTAIN MAHOGANY
ML	MINED LAND

MILES
0 5 10
NORTH

File: 1298-551-IGG

Date: 5/18/99

Reviewed By: KK & RD

CUMULATIVE EFFECTS STUDY AREA VEGETATION COMMUNITY MAP

Figure 5.5.1

Mitigation for impacts to wildlife resources is presently incorporated into the Proposed Action. Steep pit walls that limit the formation of littoral habitat and deter the construction of nesting sites would provide the highest benefit to animals in the CESA. These impacts are below the level of significance.

5.5.9 Visual Resources

5.5.9.1 Significance Criteria

The assessment of visual impacts is based upon impact criteria and methodology described in the BLM Visual Contrast Rating System (BLM Manual Handbook, Section 8431-1). Effects to visual resources are assessed for the construction, operation, and closure of the Proposed Action. Quality of the visual environment is defined by BLM VRM classes. Two issues are addressed in determining impacts: (a) the type and extent of actual physical contrast resulting from an action and related activities, and (b) the level of visibility of a facility, activity, or structure. Impacts are considered significant if visual contrasts that result from landscape modifications affect the following:

- The quality of any scenic resources; scenic resources having rare or unique values;
- Views from, or the visual setting of, designated or planned parks, wilderness areas, natural areas, or other visually sensitive land uses; or
- Views from, or the visual setting of, travel routes; and/or views from, or the visual setting of, established, designated, or planned recreational, educational, or scientific facilities, use areas, activities, viewpoints, or vistas.

The extent to which an action would affect the visual quality of the viewshed depends upon the amount of visual contrast created between the proposed facilities and the existing landscape elements (form, line, color, and texture) and features (land and water surface, vegetation, and structures). The magnitude of change relates to the contrast between each of the basic landscape elements and each of the features. Assessing an action's contrast in this manner indicates the potential impacts and guides the development of mitigation measures that fulfill the VRM objectives.

5.5.9.2 Environmental Consequences and Mitigation Measures

The area for analysis for cumulative effects to visual resources is shown in Figure 4.12.1. The area incorporates the entire viewshed of the Proposed Action Area. Past and present activities are encompassed in the description of the affected environment (Section 4.12.2), leaving only the reasonably foreseeable future action for considerations in the assessment of cumulative impacts to visual resources. Further mineral exploration within the cumulative assessment area would not result in significant or long-term visual impacts.

The only project that has the potential to result in cumulative impacts, when considered in concert with the Proposed Action or alternatives would be the Satellite Mine. Total additional disturbance associated with the assumed Satellite Mine would be approximately 1,500 acres and would consist of one open pit, haul roads, and two waste rock dumps. Existing ancillary facilities such as explosives magazines, truck shops, offices, et cetera located at the Project Area would be utilized for these mining operations.

The Satellite Mine would be located approximately 1.5 miles north-northwest of the Pipeline/South Pipeline mill facility at an elevation of 5,500 feet on public lands classified as Class IV, where major modification of the existing landscape is allowed. Disturbance within this classification would be allowed to dominate the view and be a major focus of viewer attention (Table 4.12.1). Consequently, construction of the open pit and waste rock dumps under this scenario would not exceed visual management objectives for public lands within the cumulative assessment area and therefore, would not generate significant cumulative impacts.

5.5.10 Auditory Resources

5.5.10.1 Significance Criteria

Noise impacts from mining would be considered significant if an action would result in the following:

- Noise levels in excess of 55 dBA, as measured outside at a sensitive receptor site.

Noise impacts from blasting would be considered significant if the Proposed Action resulted in the following:

- Maximum noise levels in excess of 70 dBA measured outside at a sensitive receptor site; or

- Ground vibration as a result of blasting that could initiate or extend observable cosmetic cracking of structures at a sensitive receptor site.

5.5.10.2 Environmental Consequences and Mitigation Measures

The identified individual projects within the CESA, including existing and proposed mining operations, each contribute noise to the natural environment. Since all the existing actions, proposed actions, and RFFA are widely dispersed throughout the CESA each project, including the Proposed Action, would not result in a significant cumulative impact to the auditory resources.

5.5.11 Land Use, Access, and Public Safety

5.5.11.1 Significance Criteria

The criteria used to evaluate the significance of potential impacts to land use, access, and public safety will be similar to the criteria used in the Pipeline project FEIS (BLM 1996a; page 4-61). An action would normally have a significant effect on the environment if it would include the following:

5.5.11.1.1 Land Use

- Result in the substantial termination or modification of a land use;
- Conflict with adopted environmental plans and goals of the community where it is located; or
- Disrupt or divide the physical arrangement of an established community.

5.5.11.1.2 Access

- Cause an increase in traffic which is substantial in relation to the existing traffic load and capacity of the roadway system; or

- Prevent or substantially reduce public access through the elimination of existing routes of travel.

5.5.11.1.3 Public Safety

- Create a potential public health hazard or involve the use, production, or disposal of materials which pose a hazard to people, animals, or plant populations; or

- Interfere with emergency response plans or emergency evacuation plans.

5.5.11.2 Environmental Consequences and Mitigation Measures

5.5.11.2.1 Land Use

Construction and operation of the Proposed Action would result in the disturbance of approximately 4,450 acres of public lands, or 15 percent of the total surface disturbance resulting from past, present, and RFFAs. With respect to mining-related disturbance alone, the Proposed Action constitutes 28 percent. The Proposed Action would disturb approximately one percent of the CESA. The amount of area that would not be reclaimed (605 acres) as part of the Proposed Action represents less than one percent of the total surface disturbance resulting from past and present actions, proposed actions, and RFFAs, and four percent of mining-related disturbance. The current uses of the public lands within the Project Area (livestock grazing and mineral exploration) are similar to those within the CESA and common in the region. The cumulative and incremental effect of the permanent loss of public lands managed for multiple uses within the CESA would be below the level of significance.

5.5.11.2.2 Access

The Proposed Action would cause a slight increase in the number of chemical deliveries and contractors to the Project Area. The cumulative or incremental impact of the increased deliveries and temporary employment of contractors on traffic conditions within the CESA would be below the level of significance.

5.5.11.2.3 Public Safety

As calculated in Section 4.14.3.3.1, the potential for accidental spills involving delivery tankers would be low. Tables 4.14.3 and 4.14.4 show that a 50 percent increase in diesel fuel deliveries for the Proposed Action (over existing CGM operations) results in a five percent increase in spill potential. A 123 percent increase in sodium cyanide deliveries results in a three percent increase in spill potential. The Proposed Action would result in an increased potential for an accidental spill resulting from the shipment of hazardous materials to the Project Area beyond the current potential resulting from shipments to existing mining operations

in the CESA using the I-80 and SR 306 travel routes. However, the cumulative and incremental effect of the increased spill potential within the CESA would be below the level of significance and is further minimized by the implementation of federal and state regulations by licensed and certified transporters.

The public safety impacts of storing and using hazardous materials at the Project Area would be minimized by the implementation of the SPCCP and Hazardous Material Spill and Emergency Response Plan by CGM at its facilities. The cumulative or incremental impact of the Proposed Action on increased and prolonged storage and use of hazardous materials within the CESA would be below the level of significance.

5.5.12 Recreation and Wilderness

5.5.12.1 Significance Criteria

An action would normally have a significant effect on the environment if the following would occur:

- Conflict with established recreational, educational, religious, or scientific uses of the area;
- Result in nonconformance with the Wilderness Act of 1964 or the BLM Interim Management Policy for Lands Under Wilderness Review;
- Substantially degrade or reduce the quantity or quality of the area available for existing or future recreational opportunities; or
- Result in the unmitigated loss of a unique recreational resource.

5.5.12.2 Environmental Consequences and Mitigation Measures

Construction and operation of the Proposed Action would result in the disturbance of approximately 4,450 acres of public lands, or 15 percent of the total surface disturbance resulting from past and present actions, proposed actions, and RFFAs. With respect to mining-related disturbance alone, the Proposed Action constitutes 28 percent. The Proposed Action would disturb less than one percent of the total recreational acreage available within the CESA (NDSP 1987; Planning Regions IV, V, and VI, page 4-3). The amount of area that would not be reclaimed (605 acres) as part of the Proposed Action represents less than one percent of the total surface disturbance resulting from past, present, and RFFAs, and four percent of mining-related disturbance. The recreational characteristics of the public lands within the Project Area are similar to those within the CESA and common in the region. The cumulative and incremental effect of the loss of recreational opportunities on public lands within the CESA would be below the level of significance.

5.5.13 Socioeconomic Values

5.5.13.1 Significance Criteria

NEPA (Section 1508.14) states that *"...economic or social effects are not intended by themselves to require preparation of an environmental impact statement. When an environmental impact statement is prepared and economic or social and natural or physical environmental effects are interrelated, then the environmental impact statement will discuss all of these effects on the human environment."* Simply put, this means that social or economic differences are not enough to result in a potentially significant adverse effect, but they need to manifest themselves with some physical change, as described in NEPA (Section 1508.8(b)), *"...effects may include growth inducing impacts and other effects related to induced changes in the pattern of land use, population density or growth rate"*.

As identified during the scoping process and from the Pipeline project FEIS (BLM 1996a; pages 4-54 through 4-56), an action would normally have a significant effect on the environment if the following would occur:

- Induce substantial growth or concentration of population;
- Displace a large number of people;
- Cause a substantial reduction in employment;
- Substantially reduce wage and salary earnings;
- Cause a substantial net increase in County expenditures; or
- Create a substantial demand for public services.

5.5.13.2 Environmental Consequences and Mitigation Measures

The Proposed Action would produce socioeconomic effects which are either beneficial or below the level of significance. Continued utilization of public services

under the Proposed Action would not result in significant impacts. There are numerous past and present mining operations occurring in the three-county CESA. Modern mining has essentially created (or re-established) communities in the CESA and contributed significantly to the high population growth of CESA communities during the 1980s, and continued slower growth during the 1990s (see Table 4.16.1). The Proposed Action represents only a continuation of a past approved action (the Pipeline project).

RFFAs include other mineral development projects by CGM to occur in the vicinity of the Project Area, including the Satellite Mine and a new mine south of the Cortez Facilities. Like the Proposed Action, the Satellite Mine and the new mine would likely utilize existing CGM employees, and would extend their employment, and the beneficial impacts determined in Section 4.16.3.3.1, by approximately three and six additional years.

Specific information regarding the timing, duration, and level of employment are not available for other future actions which may occur throughout the three-county CESA, precluding a comprehensive analysis of potential cumulative impacts. However, other future mining projects in the CESA would provide employment opportunities in Elko, Eureka, and Lander Counties where 30, 33, and 42 percent of the population is already reliant on employment in the mining industry (see Table 4.16.6), and where the future of mining employment is uncertain. The Nevada state Demographer's middle-range population estimate scenarios, used to make population projections for each county, assumed that each CESA county would experience some amount of layoffs in the mining industry, as well as commencement of some new mines and continued mineral exploration. In the volatile economy of the foreseeable future, it is expected that the cumulative and incremental socioeconomic and public service effects of the Proposed Action would be positive and not significant.

5.5.14 Environmental Justice Effects

5.5.14.1 <u>Significance Criteria</u>

EPAs' *Interim Final Guidance For Incorporating Environmental Justice Concerns in EPA's NEPA Compliance Analyses* (EPA 1997) suggests a screening process to identify environmental justice concerns. This two-step process defines the significance criteria for this issue; if either criteria is unmet, there is little likelihood of environmental justice effects occurring. The two-step process is as follows:

(1) Does the potentially affected community include minority and/or low-income populations?

(2) Are the environmental impacts likely to fall disproportionately on minority and/or low-income members of the community and/or tribal resource?

If the two-step process discussed under *Study Methods* indicates that there exists a potential for environment justice effects to occur, the following analyses are conducted to consider:

- Whether there exists a potential for disproportionate risk of high and adverse human health or environmental effects;
- Whether communities have been sufficiently involved in the decision-making process; and
- Whether communities currently suffer, or have historically suffered, from environmental and health risks and hazards.

5.5.14.2 <u>Environmental Consequences and Mitigation Measures</u>

Initial analysis concluded that the potential effects of the Project are not expected to disproportionately affect any particular population. Environmental effects that may occur at a greater distance, such as auditory resource or air impacts, would affect the area's population equally, without regard to nationality or income level. According to Section 4.11, no traditional cultural properties or E.O. 13007 sites have been identified within the Project Area that might be impacted by the Proposed Action or either of the alternatives. In addition, no traditional cultural properties have been identified in areas of RFFAs. Therefore, there are no impacts associated with the Proposed Action or RFFAs on traditional Native American religious concerns. Because there is no disproportionate effect on an identified minority population as a result of the Proposed Action or the RFFAs, no further environmental justice analyses are required.

6 CONSULTATION, COORDINATION, AND CONTACTS

6 CONSULTATION, COORDINATION AND CONTACTS

6.1 Public Participation

The scoping period was initiated by publication in the Federal Register of a Notice of Intent (NOI) to prepare an Environmental Impact statement (EIS) for the South Pipeline Project (Project) (Volume 61, No. 229, Tuesday, November 26, 1996, Page 60115). In addition, the Bureau of Land Management (BLM) prepared and distributed news releases to approximately 28 radio stations in Nevada, and articles were published in the Elko Daily Free Press and the Battle Mountain Bugle. A scoping letter was also distributed to governmental agencies, organizations, and individuals.

The formal public scoping period officially began on November 26, 1996 when the NOI was published and closed on January 31, 1997. The BLM then extended the public comment period to May 23, 1997 to ensure the broadest possible public participation in the scoping process. A scoping letter was mailed to approximately 30 individuals on a distribution list maintained by the BLM who previously expressed interest in the Pipeline project.

Two public meetings (December 10 and 11, 1996) were held to solicit information from the public on the scope of the EIS, both of which were announced in the NOI and the news releases. The first meeting was held in Battle Mountain at the BLM Battle Mountain Field Office on December 10, 1997. The second meeting was held in Crescent Valley at the Crescent Valley Senior Center on December 11, 1997. A separate public scoping briefing to the Lander County Commissioners was conducted at a regularly scheduled commissioners meeting on January 21, 1997. The purpose of the public scoping meetings and briefing was to identify issues to be addressed in the EIS, identify viable alternatives, and to encourage public participation in the NEPA process.

The majority of the issues and concerns raised during the public meetings involved the analysis of hydrological impacts, impacts to vegetation and wildlife resources, and the impacts to socioeconomic values.

Written public comments were received by the BLM during the initial 60 day public scoping period and subsequent extended scoping period. The majority of the written comments received were concerned with the following: adequately analyzing the hydrogeology impacts associated with mine dewatering including impacts to wildlife population, riparian habitat, and hot springs; and impacts to public services and utilities (schools, fire protection, roads).

6.2 Native American Informal Consultation and Information Gathering Process

The following federal legislation, regulations, and executive orders require government-to-government consultation between federally-recognized Native American Indian Tribes and federal agencies prior to taking any action that would affect Native American Indian Tribes:

- American Indian Religious Freedom Act;
- Religious Freedom Restoration Act;
- Archaeological Resources Protection Act;
- Section 106 of the National Historic Preservation Act, as amended (16 USC Section 470);
- Native American Graves Protection and Repatriation Act of 1990 (P.L. 101-601); and
- Executive Orders of former President Bush (June 14, 1991) and President Clinton (April 29, 1994).

The purpose of the government-to-government consultation process is to discuss the issues and concerns of a proposed project with local Native American Indian Tribes in the preliminary planning stages. Information gathered from the Native Americans will be used to develop Project alternatives and mitigation measures that would reduce the effects of the Project. In addition, the tribes have access to the cultural resources and ethnography reports, as well as sections of the EIS before they are reviewed by the general public.

An information gathering process to identify Native American concerns related specifically to the Project was initiated in November 1996 and continued through the fall of 1997. The BLM sent notification letters to representatives of the following Western Shoshone tribal governments: Yomba, Battle Mountain, Duckwater, Te-Moak, Elko, Ely, South Fork, Wells;

and to the Duck Valley Shoshone-Paiute Tribes. Notification letters were also sent to the Western Shoshone Defense Project (WSDP), Western Shoshone National Council, InterTribal Council, Citizens Alert Native American Program, Nevada Indian Environmental Coalition, and to eight Newe individuals identified during the 1995 information gathering process for the Pipeline Project as knowledgeable or concerned about Cortez Gold mining projects.

An anthropologist conducted follow up phone calls to identify knowledgeable people and determine interest in a site tour. Tribal officials at South Fork and Duckwater said no individuals in their tribes expressed interest in the tour. The InterTribal Council said the letter should be routed to Te-Moak bands and to members of a Newe family that resides in Crescent Valley. A representative from Yomba was unable to attend because of a schedule conflict. Representatives from Wells were unable to attend because of bad weather. The Western Shoshone Historic Preservation Society asked to be kept informed, but was unable to send a representative.

A site tour was held in December 1996. The tour was attended by the following Newe: one person jointly representing Te-Moak Tribes and Elko Band; one person from Lee, Nevada (South Fork Band); two people from the Ely Tribe; two people from a Newe family that resides in Crescent Valley; three people from the Battle Mountain Band; and one person from the Duck Valley Tribe with ties to the Battle Mountain area. In addition, representatives of the WSDP and Great Basin Mine Watch attended, as well as an in-law of a Newe family that resides in Crescent Valley. A Newe person employed with CGM at their southern Crescent Valley facilities attended the meeting in the mine office that preceded the bus tour. During the site tour, attendees asked questions about planned dewatering and its effects - both on local springs and on the Humboldt River drainage. Following the tour, the Newe met to discuss what they had seen.

Four Newe people met in April 1997, in Crescent Valley to review photographs and water quality information from the springs currently being monitored by Cortez in connection with the Pipeline Project. The Newe discussed whether or not information about certain springs or other places should be gathered to document them as places of traditional cultural importance. The Newe also identified some places of concern associated with the springs in some of the photographs.

In October 1997, the project anthropologist met with two Newe residents of Crescent Valley as they considered whether or not to present information about the traditional use and importance of certain springs and nearby areas. The Newe said that they want to begin collecting people's knowledge about the area, but they want to do it themselves (not through anthropologists or the BLM), since the BLM cannot guarantee confidentiality. After the information is collected, the Newe will decide what to release. The Newe said that there are some sites they are concerned about within the area shown on maps as places where infiltration basins may be built. They do not want to provide information about these places unless the places are threatened by construction or other disturbance. These are places that are not supposed to be talked about except under special circumstances. The Newe who participated in the information gathering process conferred with others to decide which places of concern to identify. Areas sensitive to the Newe were identified in September, 1998.

6.3 Draft Environmental Impact Statement Preparation

In preparing the Draft EIS, the BLM communicated with and received input from many federal, state, and local agencies, as well as private organizations and individuals. The following is a list of the agencies and private organizations who provided input:

Federal Government Agencies

U.S. Army Corps of Engineers
U.S. Fish and Wildlife Service

State Government Agencies/Universities

Nevada Division of Forestry
Nevada Division of State Parks
Nevada Division of Wildlife
Nevada Natural Heritage Program

Local Governments

Battle Mountain Volunteer Fire Department
Battle Mountain Water and Sewer
Carlin City Hall
Carlin Police Department
City of Battle Mountain Parks and Recreation
City of Carlin Planning Board
City of Carlin Public Works
City of Elko Engineering Department
City of Elko Parks & Recreation

City of Elko Public Works Department
Crescent Valley Town
Crescent Valley Volunteer Fire Department
Elko Chamber of Commerce
Elko County Library
Elko County School District
Elko County Sheriff's Department
Elko Fire Department
Elko Police Department
Eureka County Economic Development Council
Eureka County Public Works
Eureka County School District
Eureka County Sheriff's Department
Eureka Volunteer Fire Department
Lander County Department of Building and Planning
Lander County School District
Lander County Sheriff's Department
Tri-County Development Authority

Private Organizations

Battle Mountain Realty
Canyon Waste Disposal
Coldwell Banker, Elko
Coldwell Banker, Spring Creek
Elko County Association of Realtors
Intertech Services Corporation
Northeastern Nevada Development Authority
Spring Creek Association
Spring Creek Utilities
Western Shoshone Defense Project

6.4 Draft Environmental Impact Statement Review

Approximately 300 copies of the DEIS were distributed by mail to various federal, state, and local agencies; elected representatives; environmental and citizens groups; industries and businesses; and individuals. A listing of the agencies, organizations, and individuals who received copies of the DEIS in July, 1999, follows.

Federal Agencies

Department of Defense
- Army Corps of Engineers - Reno, NV; Sacramento, CA; San Francisco, CA
- NAS Fallon - Fallon, NV
- National Training Center - Fort Irwin, CA
- Air Force - Washington, D.C.
- Yucca Mountain Project - Las Vegas, NV

Department of the Interior
- Bureau of Land Management - Carson City, NV; Elko, NV; Ely, NV; Las Vegas, NV; Reno, NV; Washington, D.C.; Winnemucca, NV
- Bureau of Reclamation - Denver, CO
- Environmental Assessment Division - Washington, D.C.
- Fish and Wildlife Service - Reno, NV; Washington, D.C.
- Minerals Management Services, Offshore
- National Park Service - Washington, D.C.
- Natural Resources Library - Washington, D.C.
- Office of Environmental Policy and Compliance - Washington, D.C.
- Office of Public Affairs - Washington, D.C.
- U.S. Geological Survey - Reston, VA

Department of Transportation, Office of Transportation and Regulatory Affairs - Washington, D.C.
Environmental Protection Agency, Office of Federal Activities - San Francisco, CA; Washington, D.C.
Environmental Protection Agency, Region IX, Office of External Affairs - San Francisco, CA
Federal Highway Administration, Office of Environmental Policy - Washington, D.C.
Library of Congress, Federal Document Section - Washington, D.C.

State Agencies

College of Law, University of West Virginia - Morgantown, WV
Colorado State University, The Libraries - Fort Collins, CO
Commission for the Preservation of Wild Horses - Reno, NV
Nevada Department of Administration - Carson City, NV
Nevada Department of Administration, State Clearinghouse/SPOC - Carson City, NV
Nevada Department of Museums, Library, and Arts, State Historic Preservation Office - Carson City, NV
Nevada Department of Transportation - Carson City, NV
Nevada Department of Transportation, Right-of-Way Division - Carson City, NV
Nevada Division of Environmental Protection, Bureau of Mining Regulation and Reclamation - Carson City, NV
Nevada Division of Minerals - Carson City, NV
Nevada Division of Water Resources, State Engineer - Carson City, NV
Nevada Division of Wildlife - Elko, NV; Eureka, NV; Habitat Division - Reno, NV

Nevada Natural Heritage Program - Carson City, NV
University of Miami, Marine Affairs - Miami, FL
University of Nevada, Department of Mining Engineering - Reno, NV
University of Nevada, Gund Ranch - Beowawe, NV
University of Nevada, James R. Dickinson Library - Las Vegas, NV
University of Nevada Libraries - Reno, NV
University of Nevada, Mackay School of Mines - Reno, NV

County Agencies

Board of Lander County Commissioners - Battle Mountain, NV
Board of Eureka County Commissioners - Eureka, NV
Eureka County Department of Natural Resources - Eureka, NV
Eureka County Public Works - Eureka, NV
Eureka County School District - Eureka, NV
Humboldt River Basin Water Authority - Carson City, NV; Winnemucca, NV
Lander County Sheriff's Department - Battle Mountain, NV

Local Agencies

Crescent Valley Town Board - Crescent Valley, NV

Elected Officials

Congressman James A. Gibbons - Reno, NV
Governor Kenneth Guinn - Carson City, NV
Senator Dean A. Rhoads - Tuscarora, NV
Lander County District Attorney - Battle Mountain, NV

Tribal Governments

Yomba Shoshone Tribe
Te-Moak Tribe of Western Shoshone
Battle Mountain Band, Te-Moak Tribe of Western Shoshone
Elko Band, Te-Moak Tribe of Western Shoshone
South Fork Band, Te-Moak Tribe of Western Shoshone
Wells Band, Te-Moak Tribe of Western Shoshone
Ely Shoshone Tribe
Duckwater Shoshone Tribe

Private Organizations

Citizen Alert - Reno, NV
Crescent Valley Historical Society - Crescent Valley, NV
Great Basin Mine Watch - Reno, NV
Great Basin Training Services - Battle Mountain, NV
Mineral Policy Center - Bozeman, MT
National Audubon Society - Washington, D.C.
Nevada Cattlemen's Association - Elko, NV
Nevada Mining Association - Reno, NV
People for the U.S.A., Northwest Nevada Chapter - Reno, NV
Sierra Club, Great Basin Group - Reno, NV
The Nature Conservancy, Northern Nevada Office - Reno, NV
The Wilderness Society - San Francisco, CA
Western Shoshone Defense Project - Crescent Valley, NV
Western Shoshone Resources - Crescent Valley, NV

Industries/Businesses

Battle Mountain Bugle - Battle Mountain, NV
Broadbent and Associates - Reno, NV
Crescent Valley Mineral Hot Spring - Crescent Valley, NV
Echo Bay Company - Battle Mountain, NV
EIP Associates - Sacramento, CA
Elko Free Press - Elko, NV
ENSR - Fort Collins, CO
EVS Consultants - Seattle, WA
Geomega - Boulder, CO
Glamis Gold, Ltd. - Valmy, NV
JBR Environmental Consultants - Reno, NV
J.W. Patterson Associates, Inc. - Denver, CO
Kennecott Corporation - Salt Lake City, UT
LASER, Inc. - Gridley, CA
Maher Global Exploration - Truckee, CA
Nevada Land & Resources Company - Reno, NV
Newmont Gold Company - Elko, NV
Parsons, Behle & Latimer - Salt Lake City, UT
Royal Gold, Inc.
Sierra Pacific Power Company - Reno, NV
SWCA Environmental Consultants - Westminster, CO

Individuals

Joseph Carruthers - Crescent Valley, NV
C. Joel Casburn - Zephyr Cove, NV
Thomas Cope - Denver, CO
Christopher Christie, Santa Maria, CA
Dave Early - Carson City, NV

LeRoy Etchegaray - Eureka, NV
John and Billie Filippini - Beowawe, NV
Colleen Henderson - Evergreen, CO
Walter Johnson - Austin, NV
Robert A. Jones - Reno, NV
Robert D. McCracken, Ph.D. - Las Vegas, NV
Paul Sadler - Battle Mountain, NV
L.M. and Jay Scott - Crescent Valley, NV
Powell Ward - Crescent Valley, NV
John Williams - Portland, OR
Holly Wilson - Grand Junction, CO
Grace Wintle - Beowawe, NV

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7 LIST OF PARTICIPANTS

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This Chapter identifies those individuals who either provided, prepared, or participated in the exchange of information used in the preparation of this Draft Environmental Impact Statement (DEIS) for the South Pipeline Project. Individuals are identified by name, contribution to the document, and affiliation.

7.1 Bureau of Land Management EIS Team

Contributor	Position/Resource
Gary Foulkes	Lead Planning and Environmental Coordinator (Project Manager, Auditory Resources)
Gerald M. Smith	Field Manager
Wayne King	Assistant Field Manager for Nonrenewable Resources
Helen Mary Johnson	Geologist (Plan of Operations, Reclamation, Geology, and Minerals)
Tom Olsen	Hydrologist (Hydrologic Modeling)
Chris Ross	Physical Scientist, (Ecological Risk Assessment)
Scott Archer	Air Quality Specialist (Air Quality)
Joe Ratliff	Natural Resource Specialist (Soils and Hydrology)
Mike Neff	Rangeland Management Specialist (Vegetation, Range Resources)
Mike Stamm	Wildlife Management Biologist (Wildlife, Fisheries, Special Status Species)
Mary Craggett	Realty Specialist (Land Use and Access)
Chip Kramer	Outdoor Recreation Planner (Recreation)
Walt Brown	Geologist (Visual Resources)
Paul Meyers	Regional Economist (Economics)
Cynthia Ellis	Native American Coordinator (Social Issues)
Steve Brooks	Environmental Protection Specialist (Hazardous Materials)
Roberta McGonagle	Cultural Heritage Specialist (Cultural Resources, Archaeology, Ethnography, Paleontology)
Jon Sherve	Hydrologist
Eldon Allison	Geologist

7.2 EMA EIS Team

Contributor	Position/Affiliation
Richard F. DeLong	Principal Specialist (Project Manager) Education: Master of Science in Geology, Master of Science in Resource Management, University of Idaho at Moscow; Bachelor of Arts in Geology, California State University at Chico; Registered Geologist in the states of California and Idaho; Certified Environmental Manager State of Nevada. Experience: Over 18 years experience in minerals and environmental industries specializing in interpretation and implementation of NEPA for natural resource development projects. Previous experience as geologist for national and international resource development.
Kristin F. Kuyper	Senior Biologist (Assistant Project Manager and Team Leader - Vegetation, Noxious Weeds, Range, Special Status Species) Education: Master of Science Degree in Resource Management, University of Nevada at Reno; Bachelor of Science Degree in Wildlife Biology, Colorado State University at Fort Collins. Wetlands Delineation Certification Training, 1998. Experience: Over 9 years experience conducting botanical and wildlife surveys and wetland delineations. Additional experience includes the preparation and management of environmental impact documents and obtaining permits and licensing approvals for a variety of projects.

Dwight L. Carey	Principal (Project Principal) Education: Doctor of Environmental Science and Engineering, University of California at Los Angeles; Master of Science in Geology, University of California at Los Angeles; Bachelor of Science in Geology, California Institute of Technology. Experience: Over 22 years experience in providing comprehensive environmental services to industrial and natural resource development clients; recognized as NEPA/CEQA compliance expert; and supervises EMA's air quality impact and air dispersion modeling assessments.
Opal F. Adams	Senior Environmental Specialist (Team Leader - Paleontology) Education: Master of Science in Geology, Mackay School of Mines - University of Nevada, Reno; Bachelor of Science in Geology, University of Idaho. Experience: Over 23 years of experience in exploration and mine geology. Experience in investor relations and technical editing and writing.
Kimberly C. Belka	Senior Geologist (Team Leader - Hazardous Materials) Education: Master of Public Administration, University of Nebraska at Omaha; Bachelor of Arts in Geology/Environmental Studies, Wright State University. Experience: Over 7 years experience in performing environmental assessments, sections of environmental impact assessment documents, and other reports for investigation on hazardous substance, spills, and releases. Responsible for employee and public safety during field investigations.
Christina W. Lovato	Environmental Specialist (Team Leader - Socioeconomics) Education: Bachelor of Arts in Environment, Economics, and Politics, Claremont McKenna College Experience: Over 4 years experience in assessing environmental impacts for NEPA and CEQA documents and more specifically for mining projects in rural areas and transportation projects in urban areas. Ms. Lovato has also conducted socioeconomic assessments, land use surveys, and prepared reclamation and air quality permit applications.
Terry R. Thomas	Principal (Team Leader - Auditory Resources) Education: Doctor of Environmental Science and Engineering, University of California at Los Angeles; Master of Science in Plant Sciences, University of California at Riverside; Bachelor of Science in Biology, University of California at Los Angeles. Experience: Over 20 years experience of project management in the preparation of environmental impact assessments and permit documents for the mining, geothermal, and other natural resource development industries.
Dave N. Wittorff	Senior Environmental Specialist (Team Leader - Air Quality) Education: Master of Science Degree in Atmospheric Physics, University of Nevada at Reno; Bachelor of Science Degree in Applied Physics, University of California at Davis. Experience: Responsible for conducting air quality and hazard assessments and permit acquisition and environmental document preparation for mining, geothermal, and other natural resource development and industrial clients. More specific expertise includes conducting regulatory evaluations and assessments; conducting computerized air dispersion modeling and air quality impact studies and hazardous materials risk management and prevention program (RMPP) off-site consequence (OSC) analyzes; preparation of air pollution emission estimates and characterizations, including Title V emission inventories; preparation of air toxic emission inventory plans and assessments; and preparation of hazardous materials business plans and chemical inventories.

EMA PROFESSIONAL ASSOCIATES:

Mary Darling	Darling Environmental & Surveying, LTD (Team Leader - Wildlife and Fisheries) Education: Juris Doctorate in Environmental Law, University of the Pacific, McGeorge School of Law; Master of Science in Biological Sciences, California State University at Sacramento; Bachelor of Science in Biological Science at California State University at Sacramento. Experience: Over 19 years experience in natural resource management and 11 years experience with environmental law. Considerable expertise in federal regulatory processes dealing with environmental issues and is skilled in research, analysis, and implementation of federal and state laws and regulations. Her expertise is supplemented with additional experience as a professional fish and wildlife biologist, specializing in threatened and endangered species, big game, and aquatic population/habitat relationships.
Daniel Davis	Broadbent and Associates (Team Leader - Geology) Education: Master of Science in Geochemistry, State University of New York at Stony Brook; Bachelor of Science in Geosciences, University of Arizona at Tucson. R.G., C.E.M. Experience: Over 9 years of experience in geochemical and geological investigations, water quality assessments, environmental analysis and solid and hazardous waste. Professional experience includes the evaluation of impacts from mining activities on surface and ground water quality.
James I. Drever	Consultant (Ground Water Quality) Education: Doctor of Geochemistry, Princeton University; Master of Arts in Geochemistry, Princeton University; Master of Arts in Chemistry, Cambridge University in England; Bachelor of Arts in Chemistry, Cambridge University in England; Registered Professional Geologist, Wyoming. Experience: Over 8 years experience in geochemical and geologic investigations, water quality assessments, environmental analysis and solid and hazardous waste for mining and other projects. More specific experience includes evaluating ground water, mine tailings, and waste rock geochemistry and interpretation of environmental effects.
Julie Etra	Western Botanical Services (Team Leader - Soils) Education: Master of Science in Agronomy, Colorado State University at Fort Collins; Bachelor of Science in Environmental Biology, University of Colorado at Boulder. Experience: Over 14 years experience in the areas of erosion control, revegetation, restoration, of disturbed sites and wetlands, and botanical surveys for mining and development projects located throughout the states of Nevada and California.
Polly Quick	The IT Group, Ethnographer (Team Leader - Ethnography) Education: Doctor of Anthropology, Harvard University; Master of Arts in Anthropology, Harvard University; Bachelor of Arts in Anthropology, Radcliffe College. Experience: Over 18 years experience conducting Native American consultations, cultural resources evaluations, and social impact assessments for environmental impact assessment studies. Dr. Quick has additional experience managing community relations programs for planning, siting, permitting, and hazardous waste remediation projects; public involvement and outreach efforts for highway and mass transit projects; facilitating contentious public meetings; and developing and delivering training in public involvement and communications skills.
Charles Wisdom	Parametrix, Inc. (Team Leader - Ecological Risk Assessment) Education: Doctor of Philosophy in Chemical Ecology, University of California at Irvine; Bachelor of Arts in Biology, University of California at San Diego; Associates of Arts, Orange Coast College at Costa Mesa.

	Experience: Over 15 years of professional experience in toxicology, determining toxicity with a variety of subject organisms and investigations in the environmental impact of natural and man-made chemicals.
David Zeanah	Intermountain Research (Team Leader - Cultural Resources) Education: Dr. Zeanah received a Bachelor of Arts degree in anthropology from the University of Alabama in 1982, and a Doctor of Philosophy in anthropology from the University of Utah in 1996. Experience: Over 25 years experience directing several hundred archaeological projects of varying size and degree of complexity. He has designed, authored, or co-authored volumes of reporting research including regional summaries and research designs; large scale surveys; toolstone procurement and use; technological, functional, or morphological analysis of lithic tools; predictive models of prehistoric land use or site sensitivity; and settlement pattern studies.
Chuck Zimmerman	Brown and Caldwell (Ground Water Quantity) Education: Master of Business Administration, University of Nevada at Reno; Master of Science in Geology, University of New Mexico at Albuquerque; Bachelor of Science in Geology, University of California at Berkeley. Experience: Over 21 years experience in mining geology, mining hydrology, and hydrologic and environmental consulting. His area of emphasis is in mine dewatering studies, ground water plume mitigation, pit lake water quality evaluations, mine water supply, and material/facility characterization.
Mark Zuber	Consultant (Team Leader - Surface and Ground Water Hydrology) Education: Master of Science in Earth Resources/Geohydrology, Colorado State University at Fort Collins; Bachelor of Arts in Earth Studies, University of California at Santa Barbara; Registered Geologist, California; Certified Engineering Geologist, California; and Certified Hydrogeologist, California. Experience: Over 20 years experience in the application of earth sciences to environmental, engineering, and ground water projects. His expertise includes hydrogeologic characterization, monitoring, subsurface investigations, aquifer testing, analytical and numerical ground water modeling for landfills, petroleum refineries, mines, and other industrial uses. Mr. Zuber is also experienced with design and construction for contaminated site remediation, dewatering, and ground water supply wells.

7.3 Cooperating Agencies

Agency/Contributor	Responsibility
U.S. Army Corps of Engineers	
Nancy Kang	Biologist (Clean Water Act Compliance, Section 404 Permits)
Nevada Division of Wildlife	
Rory Lamp	Wildlife Biologist (Wildlife, Fisheries, Permit to Construct Artificial Ponds)

7.4 Other Information Contributors

Organization/Contributor	Position
Placer Dome U.S.	
Bill Upton	Environmental Manager (Environmental)

Steve Schoen	Environmental Coordinator (Environmental)

Cortez Gold Mines

Al Reuter	Environmental Engineer (EIS Coordinator)
Jim Collord	Environmental Superintendent (Environmental)
Britt Buhl	Senior Mine Engineer (Mine Planning)
Lawrence Goss	Engineer (Mine Dewatering)
Bob Gill	Engineer (Mine Dewatering)
Bill Martinich	Mine Engineer (Drainage)
Robert Hays	Chief Geologist (Geology)

Steffen Robertson and Kirsten, Inc. (SRK)

Jeff Parshley, P.G.	Division Head Mining and Permitting (Plan of Operations)
Mark Hannemann, CEM	Permitting Dept.

Geomega

Andy Davis	Vice President
Dan Stone	Hydrologist
George Fennemore	Geochemist

EVS Environmental Consultants

Sally Lawrence	Ecologist
Gary Mann	Ecologist

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8 GLOSSARY AND LIST OF ACRONYMS

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8.1 List of Acronyms

AAQSs	Ambient Air Quality Standards
ABA	Acid-base accounting
acft	Acre feet
ACHP	Advisory Council on Historic Preservation
ACQAA	Acceptable concentrations for toxic or hazardous substances for the quality of ambient air
afy	Acre-feet per year
AG	Autogenous grinding mill
AGP	Acid generating potential
amsl	Above mean sea level
ANFO	Ammonium nitrate/fuel oil mixture
ANP	Acid-neutralization potential
APE	Area of Potential Effects
ARD	Acid rock drainage
AUM	Animal unit months
BAF	Bioaccumulation Factor
BAQ	Bureau of Air Quality
BLM	Bureau of Land Management
BMAB	Battle Mountain Air Basin
BMPs	Best Management Practices
BMRR	Bureau of Mining Regulation and Reclamation
BPIP	Building Profile Input Program
CAA	Clean Air Act
CAAA	Clean Air Act Amendments of 1990
CDBG	Community Development Block Grant
CDP	Census Designated Place
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CESA	Cumulative Effects Study Area
CFB	Continuous fluid bed
CFR	Code of Federal Regulations
cfs	Cubic feet per second
CGM	Cortez Gold Mines, Inc.
CIC	Carbon-in-column circuit
CIL	Carbon-in-leach
CIP	Carbon-in-pulp
CJV	Cortez Joint Venture
cm	Centimeter
CO	Carbon monoxide
CVAB	Crescent Valley Air Basin
CWA	Clean Water Act
dBA	Decibels (A-weighted)
DCNR	Department of Conservation and Natural Resources
DEIS	Draft Environmental Impact Statement
DEM	Digital Elevation Model
DOD	Department of Defense
DOI	Department of Interior
EA	Environmental Assessment
EIS	Environmental Impact Statement
EMA	Environmental Management Associates, Inc.

EPA	Environmental Protection Agency
ERA	Ecological Risk Assessment
ESA	Endangered Species Act of 1973 as amended
EVS	EVS Environmental Consultants, Inc.
°F	Fahrenheit
FEIS	Final Environmental Impact Statement
FEMA	Federal Emergency Management Agency
FLPMA	Federal Land Policy and Management Act
FY	Fiscal year
gpm	Gallon per minute
gpm/acre	Gallon per minute per acre
H	Hydrogen
HAP	Hazardous air pollutant
HDPE	High density polyethylene
HMPs	Habitat Management Plans
HSWA	Hazardous and Solid Waste Amendments
I-80	Interstate 80
JBR	JBR Environmental Consultants, Inc.
JVA	Joint Venture Area
KOP	Key observation point
kV	Kilovolt
lbs	Pounds
Lt.	Lieutenant
LUP	Land Use Performance
MCL	Maximum contaminant level
MDB&M	Mt. Diablo Baseline and Meridian
mgd	Million gallons per day
MMPA	Mining and Mineral Policy Act of 1970
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
mph	Miles per hour
MSDS	Material Safety Data Sheet
MSHA	Mine Safety and Health Administration
MSHAct	Mine Safety and Health Act of 1977
MWMP	Meteoric water mobility procedure
NAAQS	National Ambient Air Quality Standards
NAC	Nevada Administrative Code
NCV	Net carbon value
NDEP	Nevada Division of Environmental Protection
NDETR	Nevada Department of Employment, Training and Rehabilitation
NDF	Nevada Division of Forestry
NDOT	Nevada Department of Transportation
NDOW	Nevada Division of Wildlife
NDWR	Nevada Division of Water Resources
NEPA	National Environmental Policy Act
NESHAP	National Emission Standards for Hazardous Air Pollutants
NHPA	National Historic Preservation Act of 1966
NNNPS	Northern Nevada Native Plant Society
NNHP	Nevada Natural Heritage Program
NNP	Net neutralizing potential (ANP-AGP)
NOI	Notice of Intent
No_x	Nitrogen oxides
NPDES	National Pollution Discharge Elimination System
NRCS	Natural Resource Conservation Service (Formerly SCS)

NRHP	National Register of Historic Places
NRS	Nevada Revised Statutes
NSPS	New source performance standards
NSR	New source review
NSO	Nevada State Office of the Bureau of Land Management
O_3	Ozone
OBE	Operating basis earthquake
OHV	Off-highway vehicle
PCB	Polychlorinatedbiphenyls
PCPI	Per capita personal income
pH	Potential of hydrogen
PM	Particulate matter
$PM_{2.5}$	Particulate matter less than 2.5 micrometers in aerodynamic diameter
PM_{10}	Particulate matter less than 10 micrometers in aerodynamic diameter
PM_{10}/TSP	Particulate matter less than 10 micrometers/total suspended particulate
POO	Amendment to the Pipeline Plan of Operations for the South Pipeline Project
ppm	Parts per million
Project	South Pipeline Project
PSD	Prevention of significant deterioration
PSD/NSR	Prevention of Significant Deterioration/New Source Review
RCRA	Resource Conservation and Recovery Act
RFFA	Reasonably Foreseeable Future Actions
RFFMU	Reasonably Foreseeable Future Mining Uses
RGI	Royal Gold, Inc.
RMP	Resource Management Plan
ROD	Record of Decision
ROG	Reactive organic gases
ROW	Right-of-way
RPS	Rangeland Program Summary
SAAQS	State ambient air quality standards
SAG	Semi-autogenous grinding
SARA	Superfund Amendment and Reauthorization Act of 1986
SB	Senate Bill
SCORP	Statewide Comprehensive Outdoor Recreation Plan
SCRAM	Support Center for Regulatory Air Models
sec	Second
SHPO	State Historic Preservation Office
SIP	State Implementation Plan
SMCL	Secondary maximum contaminant level
So_x	Oxides of sulfur
SPCCP	Spill Prevention, Control and Countermeasures Plan
SPPCo	Sierra Pacific Power Company
SPPP	Stormwater pollution prevention plan
SR	State Route
SRK	Steffen, Robertson and Kirsten (U.S.), Inc.
TCA	Trichloroethane
TCE	Trichloroethylene
TCP	Traditional cultural property
TDS	Total dissolved solids
TLVs	Threshold Limit Values
tpd	Tons per day
TPH	Total petroleum hydrocarbons
tpy	Tons per year
TPQ	Threshold Planning Quantity

TRI	Toxics Release Inventory
TSP	Total suspended particulate
UBC	Uniform Building Code
ug/m^3	Micrograms per cubic meter
UNR	University of Nevada, Reno
UPS	Ultimate pit surface
USACE	United States Army Corps of Engineers
USBR	United States Bureau of Reclamation
USC	United States Code
USDOT	United States Department of Transportation
USFS	United States Forest Service
USFWS	United States Fish & Wildlife Service
USGS	United States Geological Survey
VOC	Volatile organic compounds
VRM	Visual Resources Management
WAD	Weak acid dissociable
WMC	Water Management Consultants, Inc.
WSA	Wilderness Study Area
WSDP	Western Shoshone Defense Project

8.2 Glossary

Acid Generating Potential (AGP) - The amount of acid-producing constituents in a given material. For rock material, the total sulfur concentration is determined, assumed to be reactive sulfide, and reported in terms of calcium carbonate equivalent per mass of material.

Acid Neutralizing Potential (ANP) - The amount of alkaline or basic constituents in a given material. The capacity of this material to neutralize acidity is determined and reported in terms of the equivalent mass of calcium carbonate per mass of material.

Acre-Foot - Volume of water covering 1 acre one foot deep; equal to 325,900 gallons.

Alluvial Fan - A low, outspread, relatively flat to gently sloping mass of loose rock material, shaped like an open fan or a segment of a cone, deposited by a stream.

Animal Unit Month - The amount of forage required to support one animal unit for one month.

Annual Duty - The maximum permitted volume of water which may be pumped yearly from a water right or from a designated hydrographic basin.

Aquifer - A water-bearing, subsurface geologic deposit that may be composed either of rock or of unconsolidated sediments such as alluvium.

Beneficial Use - The use of water for any purpose for which benefits are derived, such as for irrigation, hydroelectric power, and industrial and domestic uses. Benefits vary with locality and custom, and what constitutes beneficial use is often defined by statute or by court decision.

Cortez Gold Mines, Inc. - CGM's mining facilities (consists primarily of the Cortez and East open pits, heap leach and processing facilities, CFB roaster, CIL mill, tailings facility, and support and administrative facilities) located immediately northwest of Cortez at the southeast end of Crescent Valley, and approximately 8 miles southeast of the Project Mine and Process Area.

Cortez - An historic mining town in Eureka County, located immediately southeast of the CGM Cortez facilities.

Cortez Gold Mines (CGM) - A subsidiary of Placer Dome U.S., Inc. (PDUS) that conducts mineral exploration and mining operations within the Joint Venture Area controlled by Cortez Joint Venture, a joint venture between Placer Dome U.S., Inc. (PDUS) and Kennecott; proponent of the Project.

Cortez Joint Venture - A joint venture between Placer Dome U.S., Inc. (PDUS) and Kennecott, to conduct mineral exploration and mining within the Joint Venture Area, which is operated by Cortez Gold Mines (CGM), a subsidiary of PDUS.

Cortez Pipeline Gold Deposit Final Environmental Impact Statement (Pipeline project FEIS) - The environmental documentation prepared to analyze the environmental impacts of the Pipeline project. The project received BLM approval.

Crescent Open Pit - A small (40 acre) open pit located adjacent to the Pipeline open pit and located within the Proposed Action

Diversion Rate - The maximum permitted rate at which water may be pumped from a designated hydrographic basin.

Ephemeral Stream - A stream channel which carries water only during and immediately after periods of rainfall or snowmelt.

Evapotranspiration - Discharge of water from the earth's surface into the atmosphere by transpiration by plants during growth and by evaporation from the soil, lakes, and streams.

Gold Acres Facilities - CGM's mining facilities (consisting principally of the Gold Acres and London Extension open pits, a waste rock dump and a heap leach facility) located on the southwest side of Crescent Valley in the Shoshone Range, approximately 2 miles northwest of the Project Mine and Process Area.

Ground Water Mound - An elevated mound-shaped surface in a water table that builds up as a result of the downward percolation of water.

Head - The height of a column of fluid necessary to develop specific pressure. Also known as pressure head.

Horse Canyon Facilities - Consists of the Horse Canyon open pit mine and associated with South Silicified Zone. Mining commenced in early 1983 and supplied ore to the Cortez mill for approximately 4 years. Mining has been completed and no new facilities or mining operations are proposed. Exploration is ongoing.

Hydraulic Conductivity - A measure of the characteristics of a unit area of an aquifer to allow water to flow through it, frequently expressed as feet per day.

Hydraulic Gradient - The change in the elevation of the water level in an aquifer over a given distance, expressed either as feet per feet or as a dimensionless number.

In Situ - In the original location.

Intermittent Stream - A stream which flows part of the year, as when fed by runoff or spring flow.

Joint Venture Area - an approximately 47,000 acre (74 square mile) area located in north-central Nevada where mineral exploration and mining operations are conducted by the Cortez Joint Venture.

Net Neutralizing Potential (NNP) - The net amount of alkaline or basic constituents in a given material minus acid generating material, or ANP-AGP=NNP. Reported in terms of the equivalent mass of calcium carbonate per mass of material.

Oxidized Ore - Mineralized rock which is comprised predominantly of oxidized or weathered rock types and is of sufficient economic value to justify mining and recovery costs.

Perched Ground Water - Ground water separated from an underlying body of ground water by an unsaturated zone of soil or rock.

Perennial Stream - A stream or reach of a stream that flows continuously throughout the year and whose upper surface is generally lower than the water table in the region adjoining the stream.

Phreatophytes - Plants whose root systems tap into the water table.

Pipeline open pit - 235 acre open pit. Mining commenced in late 1996 and is expected to support mine operations over a 10-year period.

Playa - A dried-up, vegetation-free, flat-floored area composed of thin, evenly stratified sheets of fine clay, silt or sand, and representing the bottom part of a shallow, completely closed or undrained, desert lake basin in which water accumulates and is quickly evaporated. Low-lying central area of an arid plain in which water collects and is evaporated after a period of surface runoff.

Porosity - The volume of open space between sand grains or in fractures through which ground water may flow; usually expressed as a percentage.

Project Ancillary Facilities - Those existing CGM facilities located within the Joint Venture Area, but outside the Project Area, that would be utilized by, but not modified as a result of, the Proposed Action. These project ancillary facilities include the following: that portion of the Gold Acres Haul Road and the Cortez access road located outside the Project Area; the Cortez CFB roaster, CIL mill, and tailing facilities; and the Cortez support and administrative facilities.

Project Area - A defined, 39,350-acre area within the Joint Venture Area in which all activities associated with the Proposed Action that would result in surface disturbance or the modification of existing facilities would occur. The Project Area includes the Project Mine and Process Area; the Project mine water disposal area; and other areas (in which Project exploration would be conducted; existing Project access and haul roads would be used and/or modified; and new access roads may be constructed). The Project Area is an expansion of the project area defined for the Pipeline project.

Project Mine and Process Area - An approximately 3,442-acre area within the Project Area where all mining and processing activities at new and/or modified Project facilities associated with the Proposed Action would occur. The Project Mine and Process Area would include the South Pipeline open pit, waste rock dump(s), soil stockpile(s), heap leach facilities, internal haul and access roads, exploration operations, and those same facilities constructed and used for the Pipeline project. The Project Mine and Process Area would include the mine and process area of the Pipeline project.

Project Mine Water Disposal Area - An up to 956-acre portion of the Project Area to be utilized by the Project for mine water disposal. The Project mine water disposal area includes the mine water disposal area utilized by the Pipeline project.

Pipeline Project - The Cortez Gold Pipeline Project consist of a 1,827-acre development. The project includes the Pipeline open pit mine, associated dewatering system and waste rock dumps, a combined heap leach/tailings impoundment facility, a 11,000 ton/day ore-process facility, and continuing exploration drilling.

Recharge - Replenishment of water to an aquifer.

South Pipeline Project (Project) -The Proposed Action; the entirety of the activities and operations proposed by CGM and analyzed in this DEIS.

Specific Yield - The quantity of water that a unit volume of an unconfined aquifer after being saturated will yield by gravity; it is expressed either as a ratio or as a percentage of the volume of the aquifer; specific yield is a measure of the water available to wells.

Storage Coefficient - The volume of water an aquifer releases from or takes into storage per unit surface area per unit change in head.

Transmissivity - A measure of the rate of ground water flow through a unit width of an aquifer of a given thickness. It is the product of hydraulic conductivity and the aquifer thickness and can be expressed in terms of square feet per day.

Vadose Zone - A subsurface zone containing ground water at less than atmospheric pressure and air or gases at atmospheric pressure. Also known as unsaturated zone, zone of aeration, or zone of suspended water.

Weak Acid Dissociable (WAD) Cyanide - This term refers to the analytical method used to determine the weakly bound complexes of the cyanide compound and is generally considered to include free cyanide and the less-stable metallo-cyanide complex compounds. Iron and cobalt cyanide complexes are more stable and typically do not report as WAD Cyanide.

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9 REFERENCES

9 REFERENCES

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The following is a key-word index of words and phrases used in the South Pipeline Draft Environmental Impact Statement: